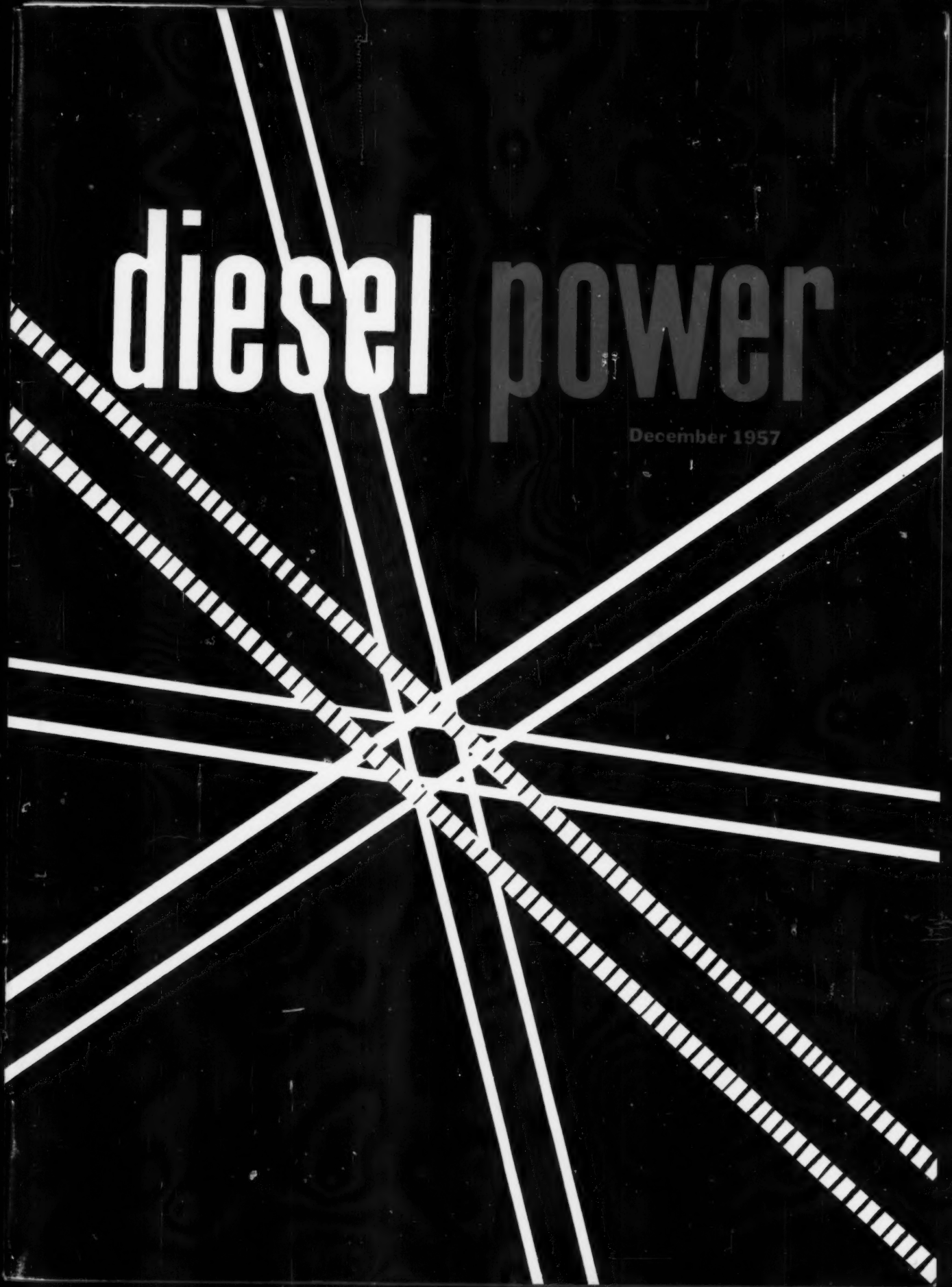
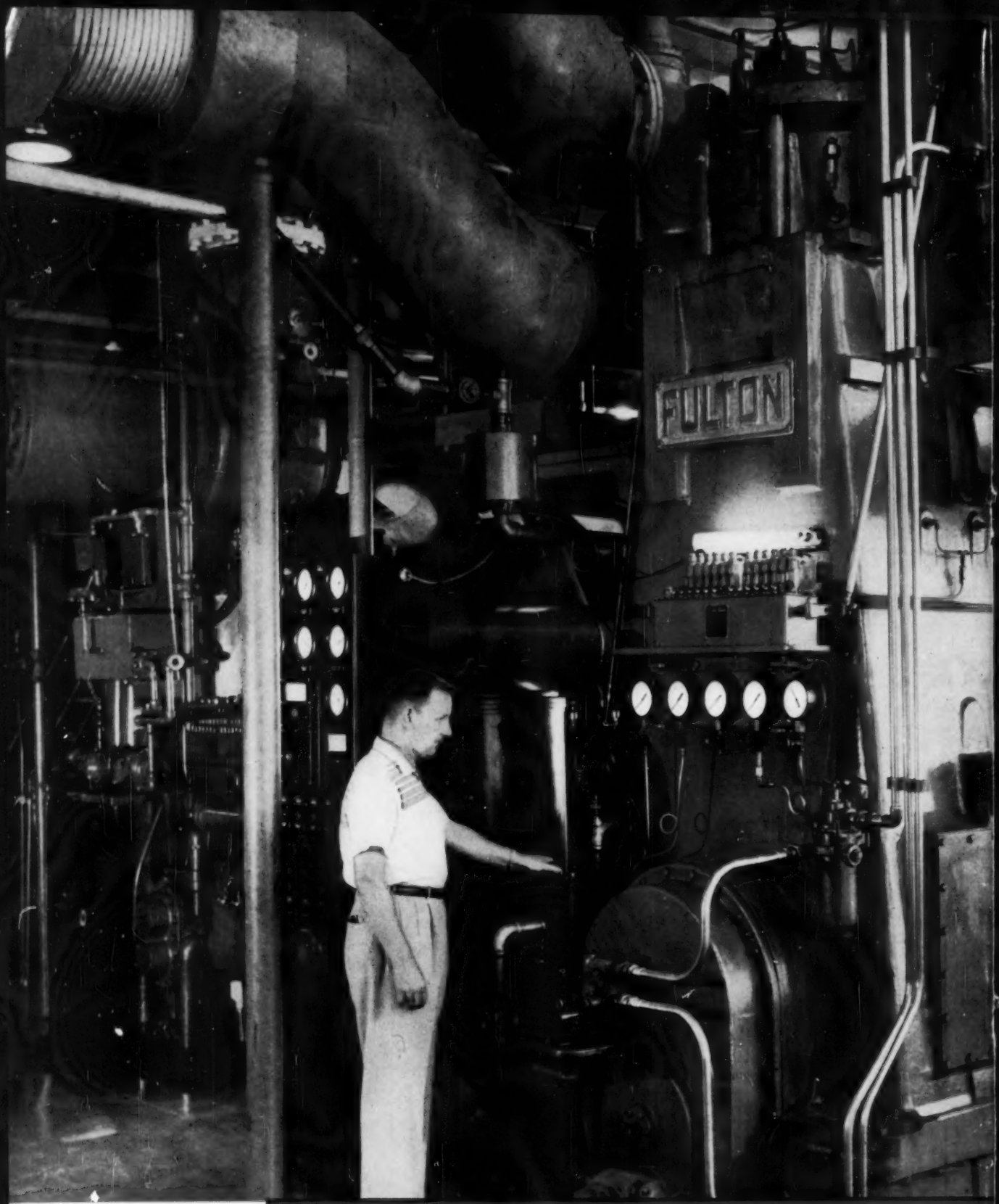
diesel power

December 1957





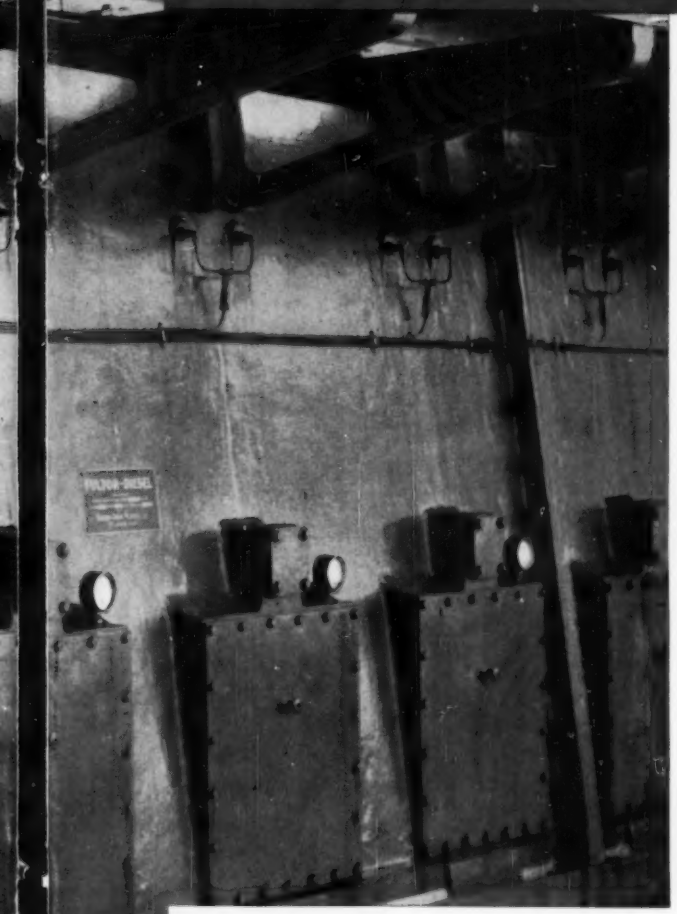
TUNE IN:
METROPOLITAN
OPERA
radio broadcasts
every Saturday afternoon

TEXACO

TEXACO
REG T M

IN 25 YEARS

"no harmful deposits, no stuck rings, minimum wear"



FOR OVER 20 YEARS, MORE STATIONARY DIESEL H.P. IN THE U. S. HAS BEEN LUBRICATED WITH TEXACO THAN WITH ANY OTHER BRAND

This is a report on a mid-western utility plant (name on request) that has been lubricating its diesels with *Texaco Ursa Oil* for a quarter of a century.

Here's what the superintendent said:

> **"We started using *Texaco Ursa Oil* with our first diesel. It gave us such fine lubrication—clean operation, no harmful deposits, no stuck rings, minimum wear—that we naturally chose *Texaco Ursa Oil* for each of the four other engines installed since. We consider this an important factor in keeping maintenance and operating costs at an absolute minimum."**

There is a complete line of the famous *Texaco Ursa Oils*. All are refined and processed especially for the lubrication of diesel, gas and dual-fuel engines—to assure *more power* with *less fuel* over *longer periods* between overhauls.

A Texaco Lubrication Engineer will gladly give you the full story. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N.Y.

URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

THE MOST IMITATED PISTON IN THE WORLD...

8 years of PROVEN PERFORMANCE

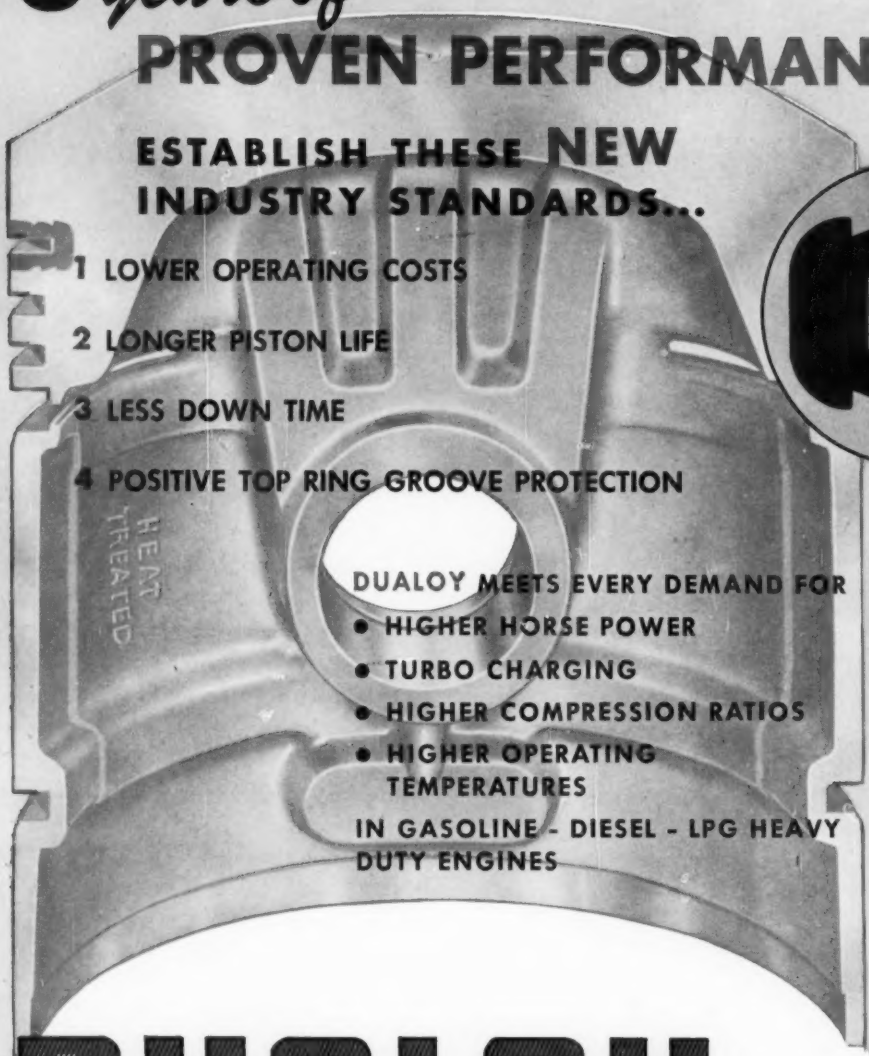
ESTABLISH THESE NEW INDUSTRY STANDARDS...

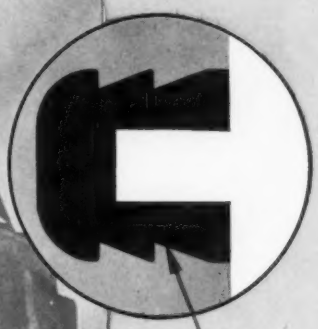
1 LOWER OPERATING COSTS

2 LONGER PISTON LIFE

3 LESS DOWN TIME

4 POSITIVE TOP RING GROOVE PROTECTION





NIRESIST IRON ARMORED TOP RING BAND INTEGRALLY CAST AND CHEMICALLY BONDED TO ALUMINUM PISTON

DUALOY MEETS EVERY DEMAND FOR

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- TURBO CHARGING
- HIGHER COMPRESSION RATIOS
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IN GASOLINE - DIESEL - LPG HEAVY DUTY ENGINES

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FOR ORE UNLOADERS
Steel Castings by:
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CAST STEEL TOP PIVOT TRIPOD.
WEIGHT 16,010 POUNDS.

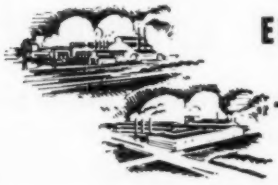
COMPLETED VESSEL

CAST STEEL EYE BAR PIVOT. WEIGHT 8,830 POUNDS.

CAST STEEL BASE PIVOT. WEIGHT 25,660 POUNDS.

Typical of Erie Forge & Steel Corporation's versatility in making steel castings from raw material to finished product are these weighty ship's unloader components for ore carrier fleets plying the Great Lakes. Unloading iron ore cargoes is a rough job. The equipment to do it demands quality steel castings with the cast-in strength and "staying power" to handle the heavy ore with speed and utmost dependability. No ordinary steel casting will do the job. Quality control from raw material selection, to furnace, to mold and through machine shop, step by step, results in components which prove their high value every day in ore transportation from range to dock-side destination. You can be *sure* of steel castings, produced "Under One Responsibility and One Control", which will do a lot more than just "meet" your requirements when you deal with us. Your Erie Forge & Steel field man will be seeing you shortly.

*PHOTOS COURTESY OF CHRISTY CORPORATION, STURGEON BAY, WIS.



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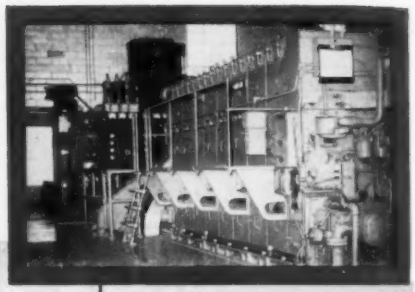
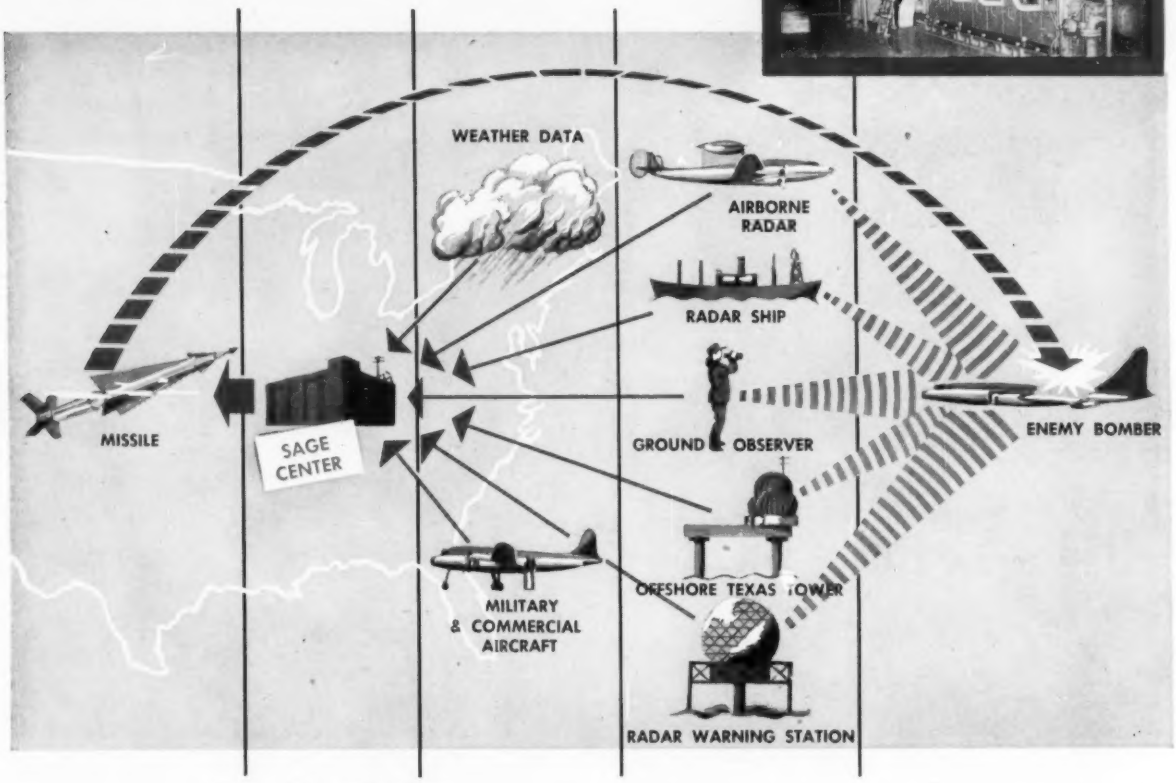
WHITE'S SUPERIOR DIESELS





SAGE system can stop enemy bombers!

A marvelous mechanical memory called SAGE (Semi-Automatic Ground Environment) will defend U.S. in event of air war. Sensitive components of this pushbutton electronic system are being installed at key military bases in the U.S. Into these defense centers, from many sources, pour thousands of scattered facts about continental aerial activity—to be collected, sorted and memorized by SAGE. In peacetime, SAGE tracks thousands of scheduled daily plane flights over North America. If war comes, SAGE can quickly identify strange planes as enemy; calculate their speed, range and direction; decide which U.S. interceptors or guided missiles are best located to make the kill, and guide them to the enemy.

Equipment failure could mean disaster in jet-speed atomic war, so reliability of every piece of SAGE equipment is absolutely essential. Dependable White Superior Diesel engines meet U.S. Air Force requirements for supplying power to SAGE units. These high-quality, heavy-duty engines are world-renown for continuous, dependable operation and quick, easy starting. Precision construction provides long, trouble-free performance with low maintenance and maximum fuel economy.

Collecting vital infomation for SAGE are various radar outposts, also powered by Superior diesels, like the "Texas Towers" (Early Warning Radar Stations) and "DEW" line (Distant Early Warning) . . . proof again of Superior's rugged dependability. Similarly, White's Superior engines can be custom-engineered to your exact requirements. White's accumulated know-how includes experience with automatic, unattended and remotely controlled operations. If your requirements range from 215 to 2150 horsepower, or 150 to 1500 KW, profit from White Superior's many advanced design features.

Get complete information now!

White Diesel

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THE WHITE MOTOR COMPANY

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diesel power

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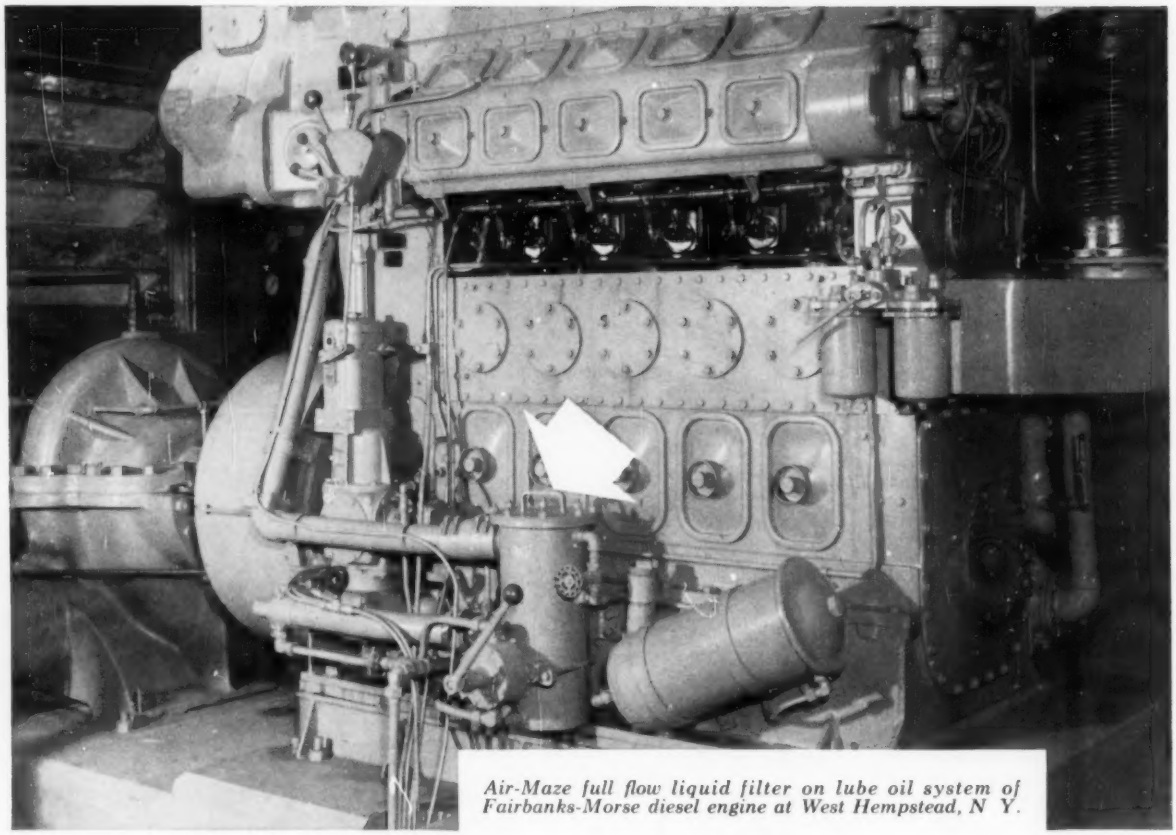
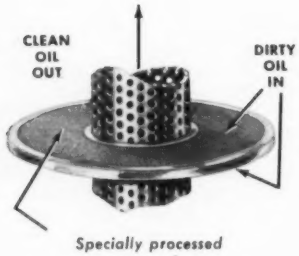


Air-Maze full flow liquid filter on lube oil system of Fairbanks-Morse diesel engine at West Hempstead, N Y.

Bearing life doubled

with AIR-MAZE liquid filters



Specially processed screen wire

Dirty oil passes through opposite sides of multiple filter discs, depositing dirt on face of screen. Clean oil is delivered through perforated tube to discharge port.

Air-Maze full flow oil filters, in combination with by-pass filters, often double the life of main bearings on diesel engines. That's because all of the oil is filtered all of the time. Wear-producing particles are stopped *before* the lube oil reaches the bearings.

The cost of an Air-Maze full flow filter is less than the expense of replacing one main bearing.

Made of specially processed screen cloth in an extended area design, Air-Maze liquid filters are easy to clean, need no replacements. Available in capacities up to 720 gpm, they may be had with or without relief valves, for both high and low pressure systems, and in various degrees of particle separation.

Write for full details in Catalog LFC-556. Air-Maze Corporation, Cleveland 28, Ohio. Dept. DP-12.

AFI MEMBER AIR FILTER INSTITUTE

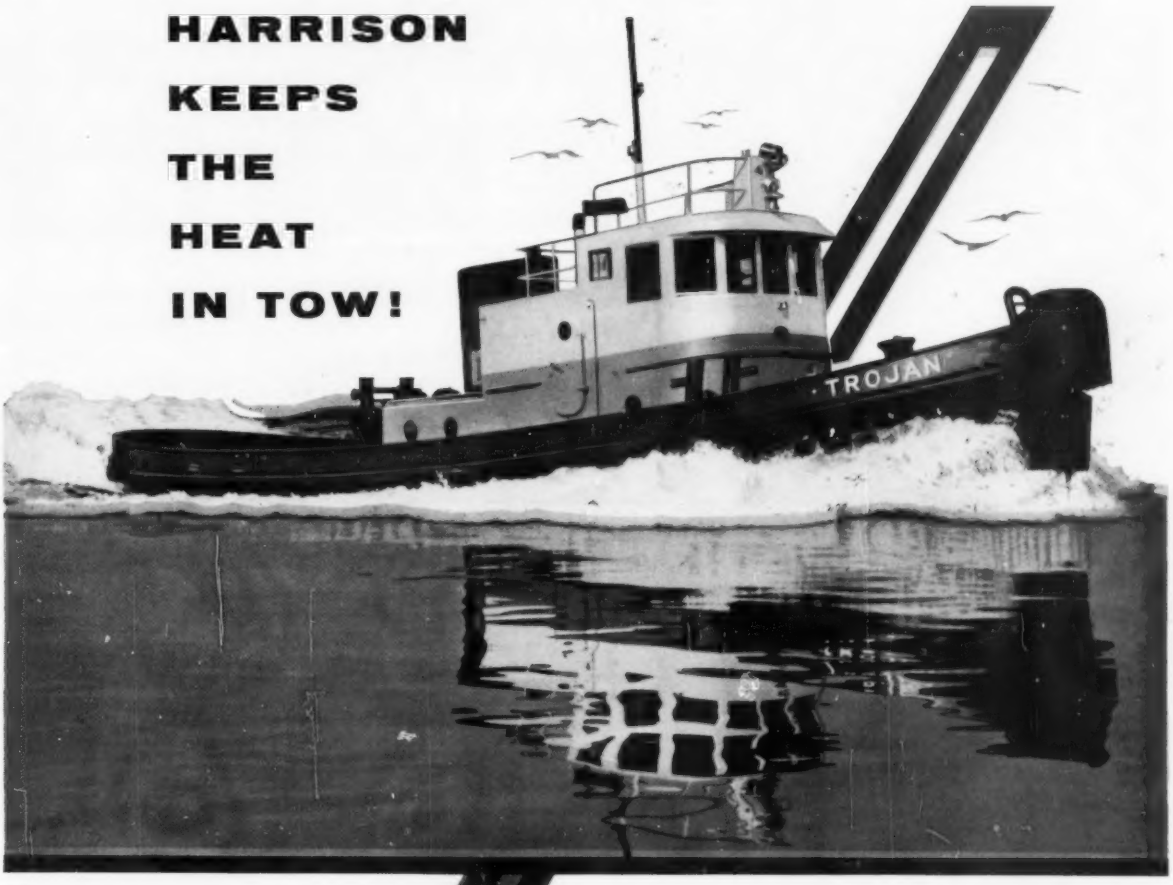
The biggest names in diesels are protected by AIR-MAZE

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

HARRISON KEEPS THE HEAT IN TOW!



Temperatures made to order for all types of diesel engines. Harrison heat exchangers are rugged, reliable and compact . . . engineered to provide the optimum in cooling efficiency.

Harrison Heat Exchangers Help Keep This Tug on Round-The-Clock Duty for 3,456 Hours!

Harrison gives heat the slip on any ship. This tug worked a 24-hour day for months with no breakdown—with Harrison heavy-duty heat exchangers on the job. Harrison heat-control equipment provides cool performance on many of today's top marine diesels . . . assures top efficiency, endurance and economy even under heavy loads. That's because Harrison is backed with over 47 years' research and manufacturing experience which assures you of complete dependability in a top-quality product. If you have a cooling problem, look to Harrison for the answer.

TEMPERATURES MADE TO ORDER

HARRISON

GM

FORWARD FROM FIFTY

HARRISON RADIATOR DIVISION • GENERAL MOTORS CORPORATION • LOCKPORT, N.Y.

On express lines . . . and at whistle stops . . .

The performance and the brand are the same around the world

Other Outstanding Shell Industrial Lubricants

Shell Tellus Oil—for closed hydraulic systems

Shell Alvania Grease—multi-purpose industrial lubricant

Shell Turbo Oil—for utility, industrial & marine turbines

Shell Dromus Oils—cutting oils for high-production metalworking

Shell Rimula Oil—for heavy-duty diesel engines

SHELL TALONA R Oil 40 offers two outstanding reasons for its acceptance as a top-rated diesel-electric locomotive lubricant. It provides superior anti-wear protection and maintains engine performance.

Greatly reduced wear on pistons, rings and cylinder liners is assured because of the selected combination of additives used in Talona® R Oil 40. It has high oxidation stability, combined with resistance toward corrosion and sludge formation. It prevents ring fouling and provides excellent detergent-dispersant action.

Today—railroad operators abroad can enjoy the same Talona R Oil 40 the domestic carriers rely upon. For complete information, write to Shell Oil Company, 50 West 50th St., New York 20, N.Y., or 100 Bush Street, San Francisco 6, Calif.

SHELL TALONA R OIL 40

SHELL

3 dependable products for the diesel industry

DE LAVAL IMO PUMPS

De Laval IMO pumps do a dependable job during long years of service. The reason is IMO design simplicity. De Laval IMO's have only three moving parts—smoothly intermeshing rotors that propel the fluid axially in a steady flow without churning, pocketing or pulsation. There are no reciprocating parts to wear or become noisy. Quiet, compact IMO pumps are excellent for direct-connected, high-speed operation. They can be furnished in capacities to 1,000 gpm and pressures to 1,500 psig.

DE LAVAL HYDRAULIC FAN DRIVES

De Laval Hydraulic Fan Drives for air cooled heat exchangers and cooling towers offer these important advantages. They *save* power since the fan operates at full speed only a portion of the time. They provide *accurate, automatic* control of engine jacket water temperature, and also assure complete operational flexibility. These units stay on the job for years. As shown, both IMO motor and speed reducer are mounted and factory aligned on a single bedplate.

DE LAVAL HIGH PRESSURE TURBOCHARGERS

De Laval turbochargers offer pressure ratios of 3:1 as well as higher compressor and turbine efficiencies than those found in conventional turbocharger systems. Output of heavy duty diesel, gas and dual-fuel engines may be doubled by De Laval turbochargers without increasing thermal loading. Exclusive Monorotor design offers a compact lightweight unit of sturdy construction. De Laval turbochargers are self-adjusting to engine loads, can be used on 4- *and* 2-cycle engines.

You'll find additional data in these De Laval Bulletins. Write for your copies.

DE LAVAL

Steam Turbine Company

TRENTON 2, NEW JERSEY

AIRESEARCH TURBOCHARGERS ANSWER "YES!" TO...

increased power?

Your engine's output can be raised up to 100%, depending on its design and application. Incorporating the most efficient turbine wheels in the industry, AiResearch turbochargers can give sea-level performance up to 12,000 feet.

lower specific fuel consumption?

The turbocharger improves engine combustion, resulting in important fuel saving per horsepower even with greatly increased engine power output.

lower engine thermal loading?

Efficient compressor wheel design holds heat-producing turbulence to a minimum, providing a smooth flow of compressed air to the engine. AiResearch turbochargers are also air-cooled, eliminating the need for complicated plumbing.

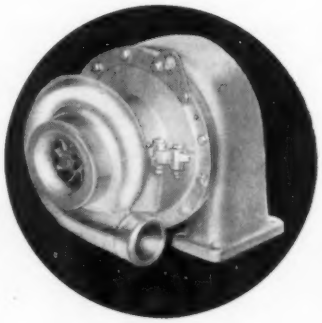
less noise and smoke?

Engine noise level is greatly decreased. Smoking is often completely eliminated.

reliability and durability?

Excellent reports on more than 13,000 AiResearch units at work in the field emphasize these qualities. AiResearch turbochargers require no attention between normal engine overhaul periods.

Your inquiries are invited.



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AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

DIESEL FUEL and LUBRICATION

BULLETIN

CITIES SERVICE

TESTS SHOW CITIES SERVICE C-300 OIL HAS LOWEST BEARING LOSS

L-4 72 Hr. Engine Run

Bearing Loss, Ave mg.

CITIES SERVICE C-300 OIL	Brand A Oil	Brand B Oil	Brand C Oil	Brand D Oil	Brand E Oil	Brand F Oil	Brand G Oil
54	550	106	170	1109	601	89	1425

New test data reveals excellent reasons why sales of Cities Service C-300 Oil have doubled in two years.

These tests, comparing C-300 with 7 leading competitive oils, demonstrate that it has by far the lowest bearing loss of all oils tested.

In addition, the over-all performance rating of Cities Service C-300—which takes into account all aspects such as corrosion and oxidation resistance, oil consumption, and detergency—was also highest of all oils tested.

For diesel trucks, buses, farm equipment, and stationary diesels, Cities Service C-300 is unsurpassed. Ask your Cities Service Lubrication Engineer for performance data.

CITIES SERVICE DEVELOPS NEW OIL FOR SEVERE-DUTY EARTH MOVING MACHINERY

To meet the exacting requirements of certain severe-duty earth movers now manufactured by the Caterpillar Tractor Company and others, Cities Service has developed an extremely rugged new oil.

Known as Cities Service C-500, this new oil is approved by Caterpillar and specially made for service as a Series 3 Oil.

Your lubrication engineer will gladly discuss the features of this new oil and the precise machinery and conditions for which it is intended.

OVER 10,000 HOURS WITH CITIES SERVICE C-400 OIL— PISTONS CLEAN AS NEW!

A Mississippi tug was having trouble. Ring breakage and oil consumption made overhaul necessary practically every time it was docked.

Then Cities Service C-400 Diesel Engine Oil was tested.

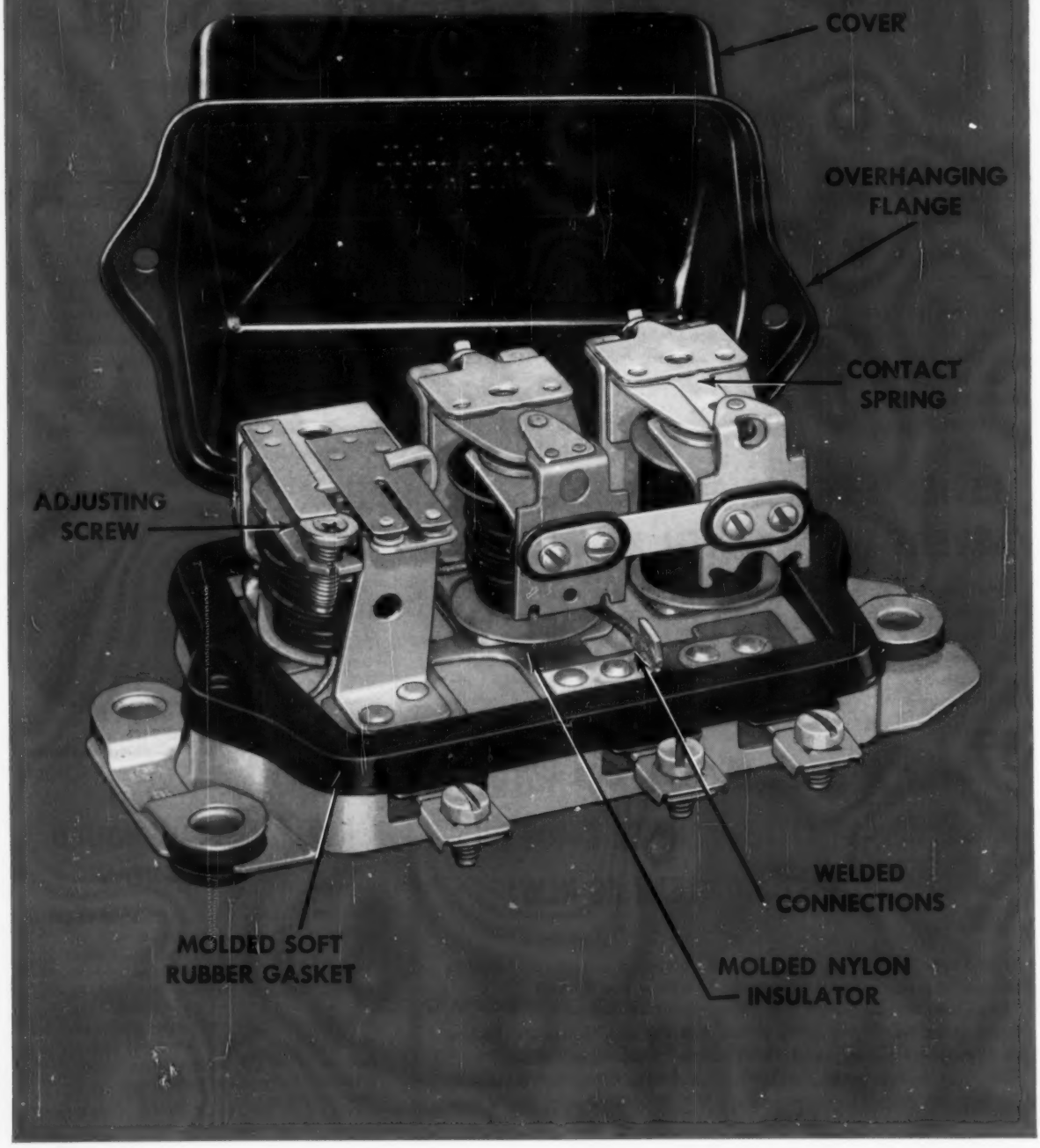
Result: After over 10,000 hours, pistons were like new. No stuck or broken rings. Horsepower was increased 5%. Oil consumption chopped in half!

This story is typical of the kind of problems Cities Service solves throughout the year. If you have lubrication difficulties, consult your Cities Service Lubrication Engineer . . . it may save you a bundle.

MAN YOU SHOULD KNOW

William J. Varetoni is a Lubrication Engineer and Technical Consultant with the Cities Service office at 60 Wall Street, New York, N. Y. With 27 years' experience in the solution of lubrication problems, he is typical of the many Cities Service Lubrication Engineers who will gladly investigate your problems without obligation. A call to the nearest Cities Service office will bring one of these men to your plant or job site.

PROGRESSIVE ENGINEERING MAKES THE DIFFERENCE



DELCO-REMY WATERPROOF STANDARD REGULATORS IMPROVE FLEET PERFORMANCE

Better electrical performance and greater dependability in any weather are important benefits to fleet operators found in Delco-Remy's waterproof standard generator regulators, now available for general replacement use.

And here are the features that make them the *right* regulators for Delco-Remy equipped cars and trucks in fleet operations.

1. New overhanging one-piece formed-steel cover and mating base shed road splash . . . convenient attaching screws are *outside* the enclosed area. Molded soft rubber gasket seals out harmful oil and water vapors.
2. Integral sleeves of molded nylon insulator form permanent seal around rivets—assure watertight base.
3. New, longer, more flexible armature contact spring on voltage regulator unit assures more positive closing of contact points for smoother operation.
4. Welded electrical connections, and highest quality tungsten and non-tarnishing precious metal contact points, assure minimum resistance, maximum durability.
5. Special fine thread screw-type controls allow easy, highly accurate adjustment of all three units.

Always replace with Delco-Remy waterproof regulators when you service Delco-Remy equipped cars and trucks. These improved regulators, built to highest quality standards by the original equipment manufacturer, are available from your car or truck dealer or the United Motors System.

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

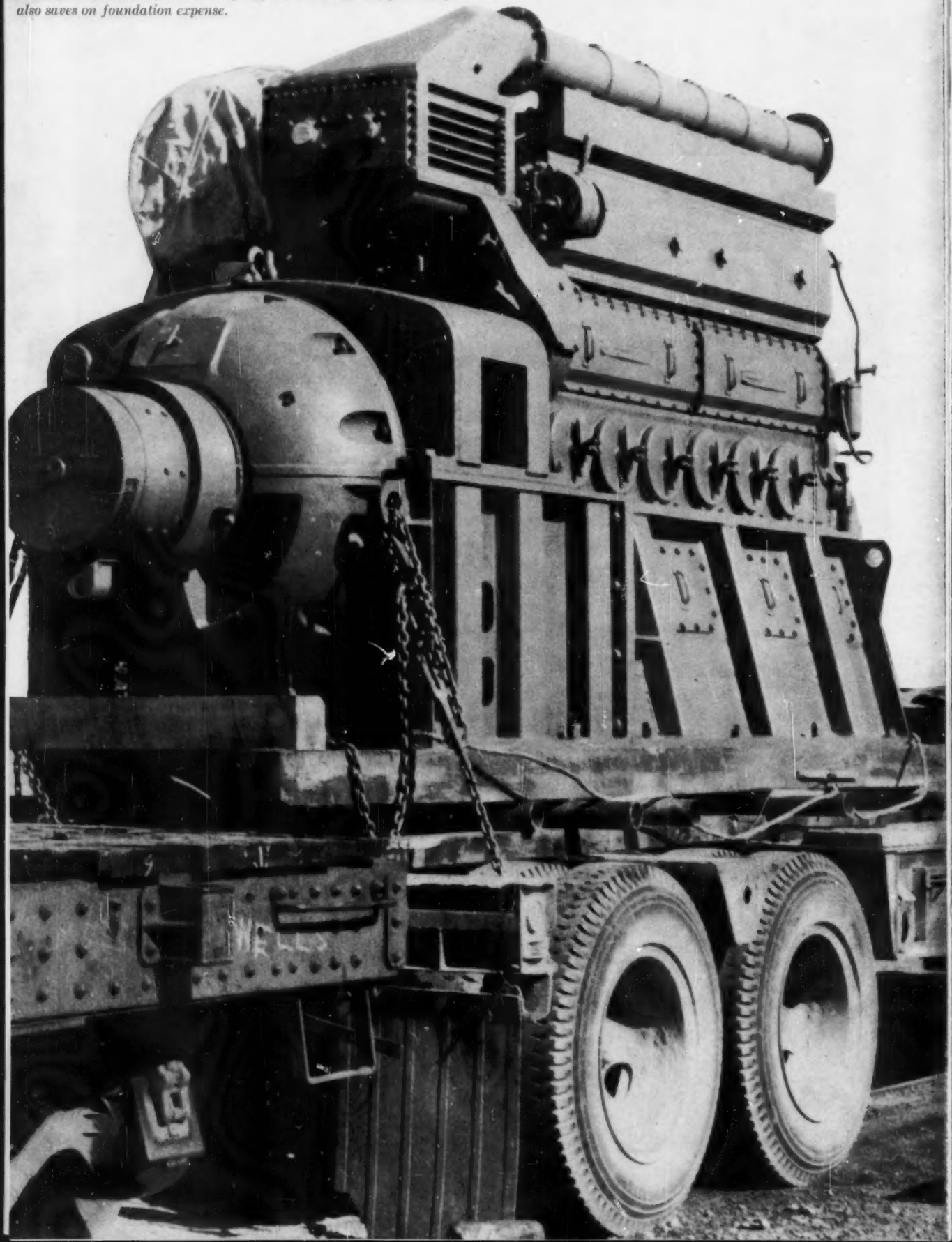
GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

ELECTRICAL SYSTEMS

500 KW IN ONE PACKAGE. *This "unitized" engine generator shipped already assembled, requires no aligning at the site. Its compact design also saves on foundation expense.*



1957 POWER!

Long famed for reliability, Worthington 1957 power engines have many new features that can help you produce permanent or standby power at the lowest costs ever achieved for real *heavy-duty* units.

LOWER INSTALLATION COSTS—The new SW 9 engine you see at left has been "unitized" with its generator to drastically cut space requirements, installation time and expense. This design requires no aligning at the site. Should needs ever change, the entire unit can just as easily be picked up and moved to another location.

LOWER FUEL COSTS—In 1957, Worthington is pioneering in power by designing and building engines *specifically* for turbo-charged operation. The SW 14, for example, is America's first high output diesel built only for high pressure turbo-charging.

For economy today *and* tomorrow, all '57 Worthington power engines can be furnished to run on the lowest cost, locally available fuels—residual, crude, and distillate oils; natural, sewage, propane or manufactured gas.

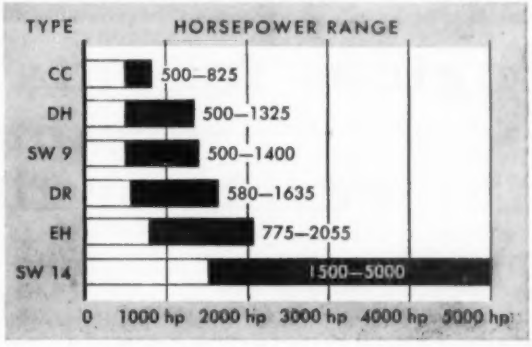
LOWER MAINTENANCE COSTS—With Worthington's 1957 engine line, you enjoy the economy of modern power design plus amazingly low maintenance. One of the many maintenance-saving features of the new SW 9, for example, is the Jet Swirl combustion chamber. The chamber is designed so that the air swirls as it enters the cylinder assuring rapid mixing of air and fuel for extremely clean combustion giving longer valve and liner life, as well as ultra-efficient operation.

The fact that every upper mechanical part is within reach from the operating level is another maintenance saving feature.

For reliable power in the 500 to 5,000 hp range, at the lowest possible cost, get in touch with your nearest Worthington District Office. Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

E-7-1

Choose your next diesel from Worthington's complete line of heavy-duty four-cycle power engines.



WORTHINGTON

Engines for this fast new fireboat are protected by Purolator filters

Diesels on Baltimore's powerful new fireboat easily push it along at a snappy 17 mph while it discharges 12,000 gallons of water every minute. But if dirt brought in by even the cleanest fuel supply should ever get into the engines, this outstanding speed and power would quickly suffer . . . and expensive repairs would follow. That's why Purolator fuel and by-pass lube filters are included as original equipment on all engines in the ship.

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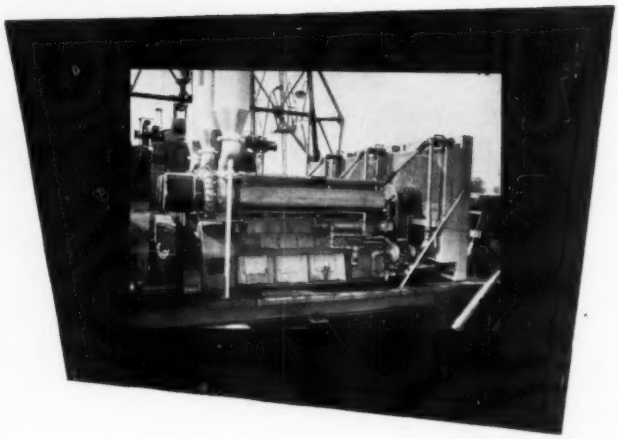

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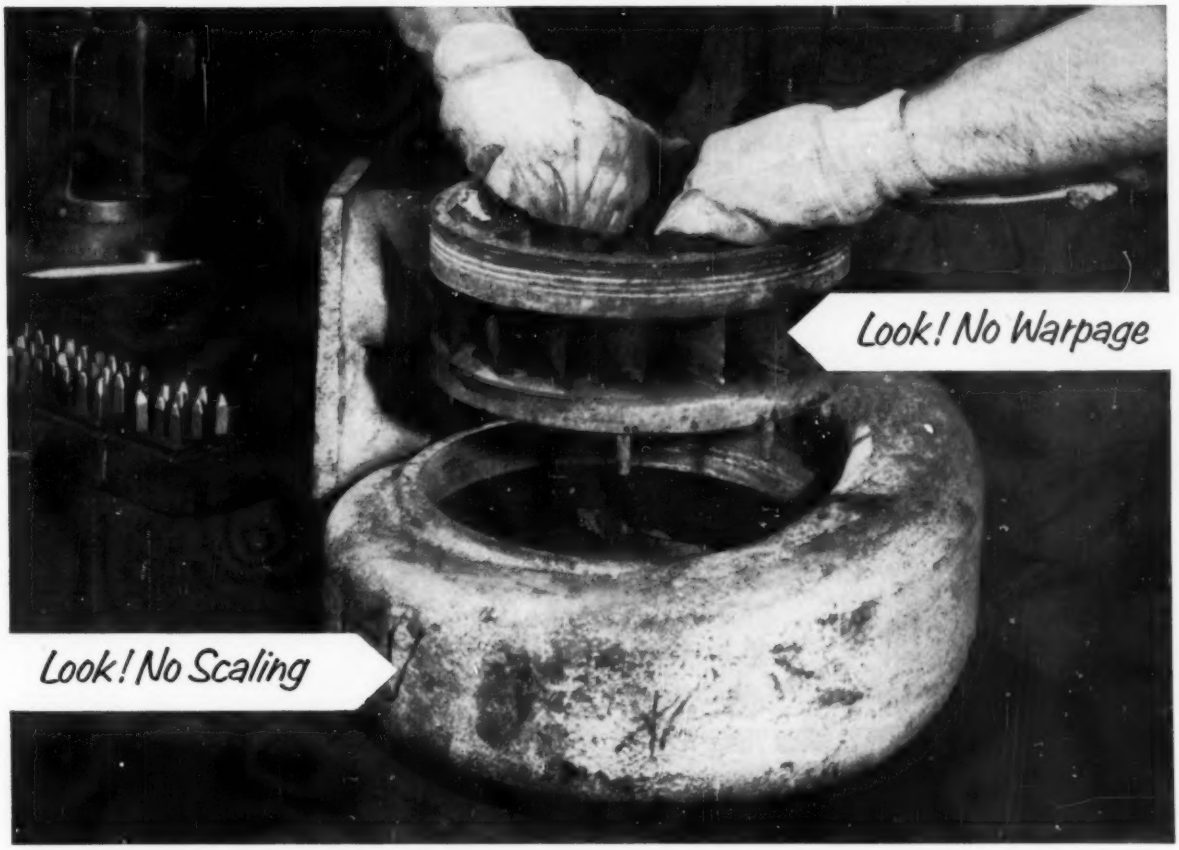

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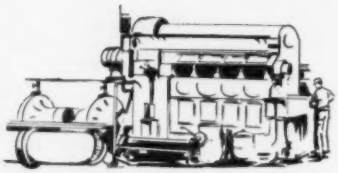

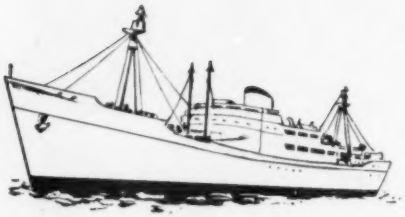

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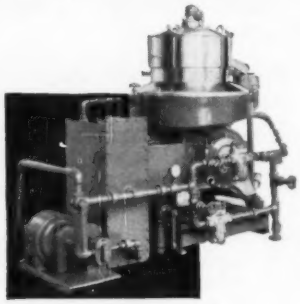

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ENGINEER'S FIELD REPORT

PRODUCT RPM DELO OIL

FIRM M. M. SUNDT CONSTRUCTION CO. Tucson, Arizona

RPM DELO OIL ends 5 years of engine troubles

The pan has never been off the Caterpillar D7 engine of this Link-Belt Speeder shovel in 7 years, using RPM DELO Oil. Only repair was a single valve job—no other parts replaced. William Naumann, Sundt's Operations Manager, says, "We tried nine different major brands of oil in five years, trying to lick the frequent breakdowns that slowed our operations. Sometimes, main and rod bearings even froze solid on the crankshaft. We changed to RPM DELO Oil seven years ago, and, since then, have never had any engine troubles due to oil failure. We now use RPM DELO Oil exclusively in our 22 heavy-duty engines."

Lubricated with RPM DELO Oil, this Caterpillar D 13000 portable unit powered a rock crusher of M. M. Sundt Construction Co. for a total of 8976 hours before overhaul. "In spite of extremely dusty conditions the only time the engine was touched was to replace a head—no other repairs were necessary," reports master mechanic Billy Gray, shown replacing air cleaner on unit following overhaul.

Austin 101 rock crusher, powered by Caterpillar unit described above, works 20 hours a day at firm's materials stockpile outside Tucson. Company works year around on road paving, grading, foundations, building construction.

Why RPM DELO Oils reduce wear —prolong engine life

● Oil stays on engine parts—hot or cold, running or idle ● Anti-oxidant resists lacquer formation ● Detergent keeps parts clean ● Special compounds prevent corrosion of bearings ● Inhibitor resists crankcase foaming

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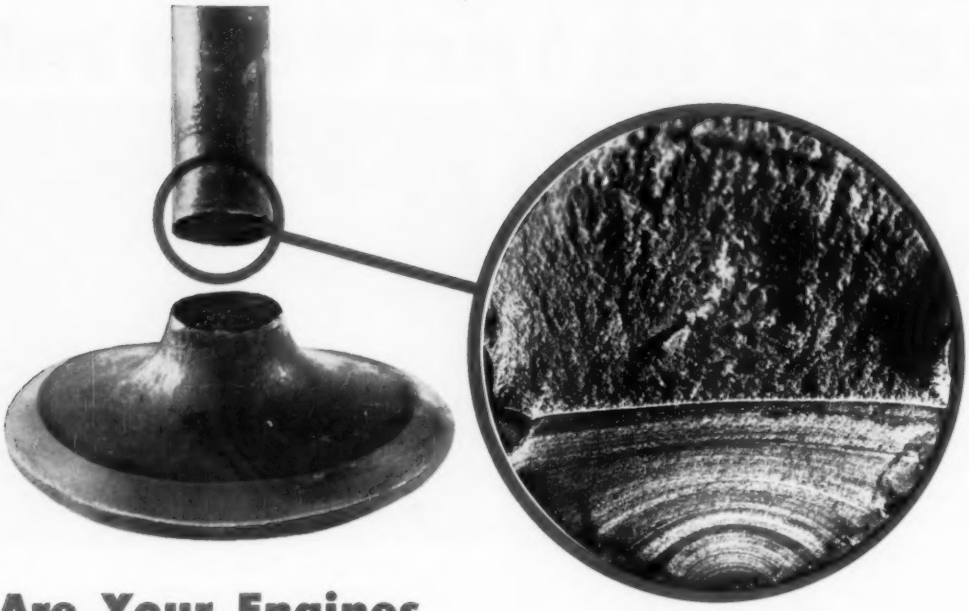

Are Your Engines Plagued by Failures Like This?

Eaton Engineers Can Help You Solve This Problem

The photographs above illustrate a typical fatigue-type failure caused by overstressing, in which fracture starts at the surface and, with repeated high stress, progresses to final break.

If you are an engine manufacturer and are having valve gear problems, Eaton engineers will be glad to consult with you and recommend procedures to help solve them. Or if you are designing new engines, perhaps our past valve experience can be valuable to you. Write, wire, or phone — there's no obligation.

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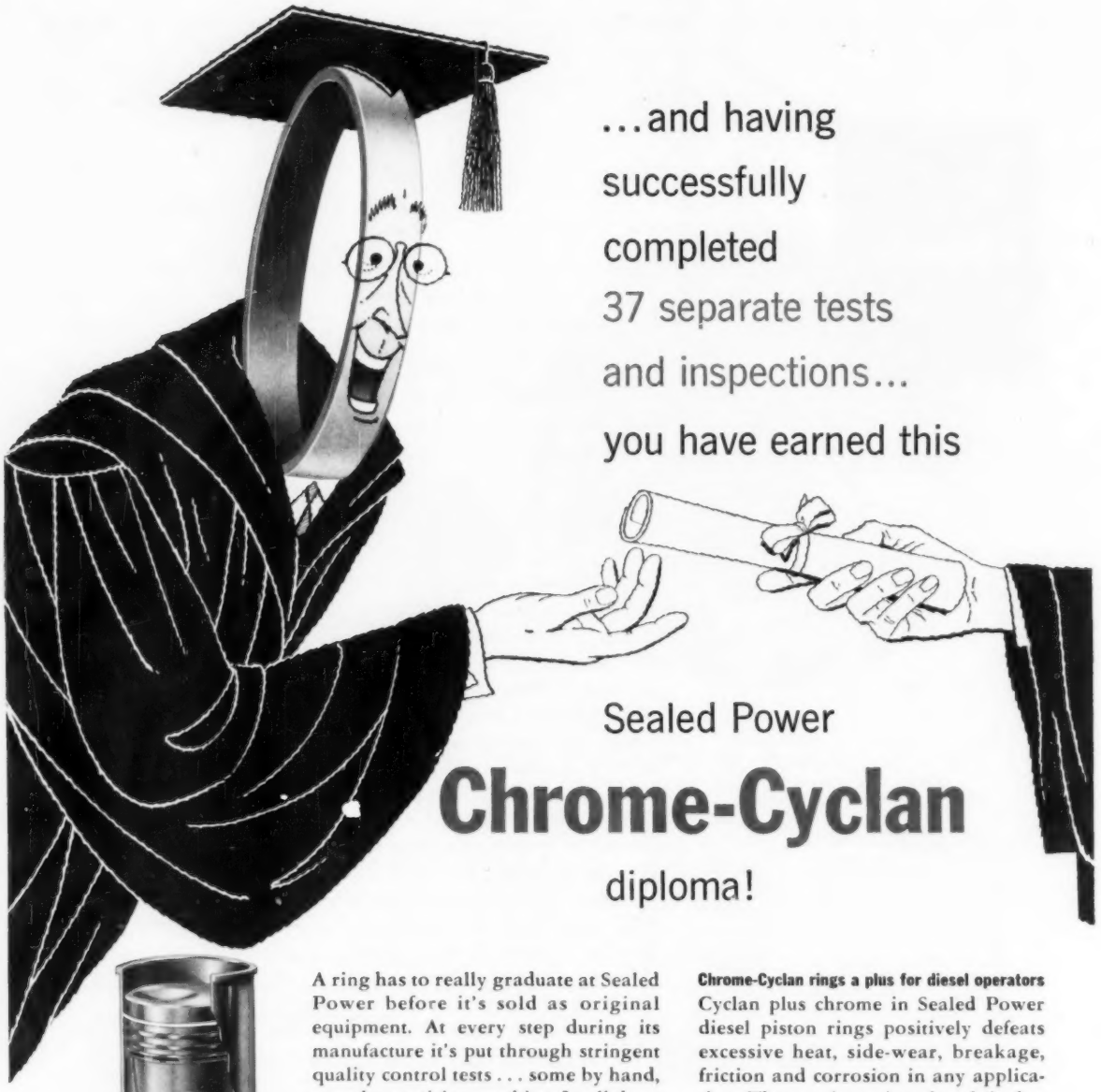
editorially speaking

A Parable for Christmas

On the day of his great audience, all manner of persons did come before the king to be heard. His people were clamoring that the products of their toil in the fields would spoil before they could get them unto market. They did spend much time and silver in moving all manner of goods. The king's generals warned that they could not move their war chariots from place to place with freedom. Should the wild tribes attack, they feared for the safety of the realm. And his ministers advised him of the great losses in substance suffered by his people in their travail brought about by the sorry state of the roads. In turn, this did affect the kingdom's coffers. As by a whirlwind, the king was beset from all sides. He did confer with his ministers and a great plan was made. He called unto him all those skilled in the building of roads, bridges and such. They helped in the plan, looking forward to when they could build mighty works. They went home in the belief that the people in the provinces would speed all that was needed to beget the fruits of this plan. Now the people had their desire. But alas, this did not come to pass. People did complain that their land, on which many did place undue value, was being wrested from them for a pittance. Others did go forth and barter for land where roads must go. They would then swell the price as a frog swells when about to croak. Whole villages did rise to protest a new road, saying that the din of wheels and hoofbeats of horses and oxen would cause all manner of evil to befall them. Their kine would not freshen; many would be the fowls killed; and their children must learn to watch both ways. Then there were those who begrudged their fair portion of the gold needed. For the kingdom's coffers were not deep enough for this purpose, depending as they did on revenue from the people. Too, the king and his ministers had not reckoned with the rise in costs. Verily, they did increase daily. So the plan did move but slowly and the vexations did mount. One day the king could stand no more. He waxed wroth and spake thus, "Ye came crying for roads; we made it possible for you to get them. Roads cannot be built by royal decree. Ye must work, ye must pay—yea, even make sacrifices—if ye really want them. Ye must decide. Face realities—or get off the pot.

The ending is not yet inscribed.

B P E



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highlights

Ultrasonics add to RR safety. Invisible defects on track are spotted and recorded by Sperry ultrasonic detector cars, supplementing induction cars. Section crews can then pinpoint flaw with a millivolt meter and make immediate rail replacements.

Helicopter now hurries replacement parts to Westinghouse customers within 100-mile radius of Pittsburgh. It also speeds shipments from the plant roof top for transfer to airlines.

Mack Trucks scored an all-time high sales and earnings record in the first nine months of 1957. Their sales were 6% over and earnings 5% above the same period last year.

Bill to allow U. S. mail to travel by common carriers will be introduced in Congress this January. An ATA committee has been named to work toward passage of this law.

LeTourneau drilling platform took only 8½ hr to complete transfer from one location to another one mile distant. Water depth at both old and new spots was about 62 ft—deeper than average for most offshore drilling. "Legs" of the rig penetrated only 5 to 7 ft in the Gulf floor. Other types of platforms have required penetration depth over 100 ft.

Electric power without even momentary interruption is guaranteed in a novel British standby engine setup. A Lister-Blackstone diesel is coupled to a high-inertia flywheel through a Twin-Disc power take-off and Blackstone damper coupling. The flywheel is permanently coupled to an alternator. Regular power, when on, turns alternator and flywheel. If power fails, the PTO connects the engine. Flywheel inertia is enough to start the engine while turning the alternator until the engine starts.

Air is being given more jobs to do. It went to work for bus and truck suspensions. Now it is protecting cargoes. U. S. Rubber, at Army request, developed a pneumatic dunnage cushion, called Shor-Kwik. It protects shipments and speeds up loading and unloading. Container Corp. reports a saving of $11.40 per RR car with these inflatable cushions instead of wooden bulkheads and blocking. Masonite Corp. had a 50% reduction in transit damage of shipments thus protected.

API is sponsoring films for TV celebrating the oil industry 1959 centennial. Top Hollywood stars, directors and writers have teamed up for production of this color series at M-G-M Studios.

Fuel cell which converts chemical energy of gases into electricity is now a reality. It may be adapted to power Army's new miniature radar set. When fully developed it is expected to eliminate need for bulky generators in other high current, low voltage applications.

Trucking industry spent over $35 billion for fuel, wages, equipment, goods and services in 1956. ATA also reports 300% gain in ton-miles hauled above 1946. Trucks licensed in 1956 went well over 10 million. Taxes were $252 million more than in 1955. Over half of each truck tax dollar went for fuel levy.

Class I railroads installed 1019 locomotive units in the first nine months of this year. All were diesel-electric except four electrics. Units on order total 266 diesel-electrics and 30 gas turbine-electric units.

ATA reports 1956 trucking income was up, profits slightly down. That's a reminder — one way to put the plus in profits is good maintenance of machines.

Vehicle statistics are looking up. Sales of diesel buses reached 3481 in 1956 — best record since 1951. Sales score of 25,797 diesel trucks was greater, too, than any in past six years. Besides selling more, they're building them better. Average life of 12½ years for all motor vehicles has doubled since 1925. Lifetime miles traveled averaged 110,000 per unit compared with only 25,750 miles 32 years ago.

GMC is sparing no effort in improving truck design and operation. With 1½ million trucks on the road even a small improvement means millions in savings for the user. For instance; if they can reduce weight of highway tractors by 500 lb, the weight can be replaced by cargo worth $730 million a year. If fuel mileage can be increased 1 mile per gal, that means annual savings of $800 million. To reach super-truck goals, GMC has expanded its engineering department by 22% the past year.

Barro Colorado Laboratory. Diesel power plant is seen at lower right. Fuel oil drums at rear of plant are connected together to form fuel system. Rugged landscape in background gives indication of transportation problem. Locating the plant at the water edge facilitates transportation.

Export Engines Can Have It Tough

Think up the toughest service imaginable, the sketchiest maintenance possible, the worst parts availability situation. You'll still probably fall short of how some exported diesels operate. For best results they must be tough, simple and sold with an adequate parts supply.

By: **ROBERT H. EMERICK** — Consulting Mechanical Engineer

IN the U. S. we overload engines—sure, but we do it to a limited extent and usually for short periods. However, in diesel-electric power plants in remote locations like the back country areas of Panama, overloading is almost standard practice. Here there isn't much choice. Lack of repair parts and competent mechanics cause prolonged engine downtime leaving a standby to struggle under overload for weeks and even months. If it were not for the great stamina of diesels (here predominently American) under continuing punishment the towns frequently would be without lights.

To understand the difficulties under which these engines operate, we must understand Panama's present condition. There is a frustrating lack of roads over which the engines and their parts can be shipped. This is typical of many Latin American countries and must be taken into consideration when choosing an appropriate engine with its set of spare parts. For example, small parts together with chickens, Indians, and other passengers are transported in modified station wagons if the road is passable. Larger parts are generally transported by air, thanks to the skill of bush pilots in landing their loads and taking off from weed-filled fields.

There are no railroads except the Panama Railroad from the Atlantic to the Pacific ends of the Canal, and a few miles of banana track for delivering bananas to the ships, near Costa Rica. South of the Zone, almost everything moves by boat and dug-out canoe.

When a plant breakdown occurs, this situation is aggravated by the almost equal difficulty of communicating with the source of supply. Main service is considered good if a letter travels 100 miles in three weeks. And sometimes getting through by telephone, after you find a telephone, takes days. Like short wave radio, you lose your connection in the middle of the conversation. It just fades out and dies, and no matter how much you crank the handle you can't recapture that distant voice.

Panama is a poor country and American prices are high, which probably explains the choice of engine capacities in many of these remote installations. Two en-

Diesel plant in El Valle is typical of those in back woods of Panama. This one houses a 10 and 20 kw Cat-driven generator.

gines of different capacity are generally obtained, the larger for base load, the smaller for standby. The theory probably is that the larger unit can absorb a few extra customers as the years go by, while the smaller is to run infrequently, just to carry emergency loads. Unfortunately the long time needed to complete base engine repairs leaves the standby overloaded for long periods. In one case this situation stretched out over a year.

Scarcity of money also has its effect on repair schedules. Machining, casting and repairing of parts almost invariably ends up in the shops of the Panama Canal Co. since there are few competent craftsmen and facilities to be found in the Republic. However this company's rules require the repair money to be depósited with them before work is started. Their repair costs are high because Canal Zone craftsmen are paid U. S. rates plus 25%. Also, the overhead must cover the expenses of 40 working-days leave given to the employee every year plus transporting his family to the States every other year.

The plant owner therefore, not only has trouble telling the world of his breakdown and obtaining repairs, but he must save up and pay up before the repair work is started. Meanwhile, the standby engine struggles to keep going without any attention beyond simple starting and stopping.

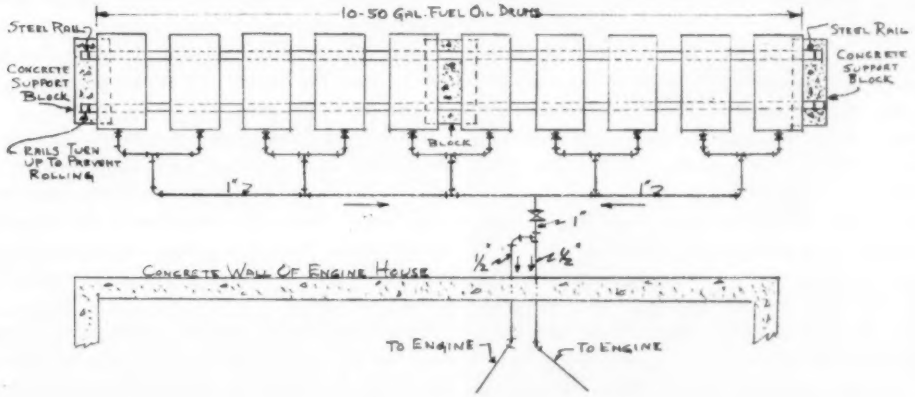
Only a very few plants can do otherwise. One of these for example, the Barro Colorado plant powering the world-famous nature laboratory run by the Smithsonian Institute, has working agreements with the Panama Canal Co. A competent diesel man periodically checks over and adjusts the engines. But this kind of expert attention is not so easily obtained at say Aguadulce, about 125 miles away from the Canal Zone. Here the writer observed an Ingersoll-Rand bleeding from every joint of its fuel system, and pounding as though one of its main bearings was crumbling by the minute. Every stroke threatened to be the last, but never was, and nobody seemed concerned over its troubles indicating the condition had existed for some time. As usual, the other engine was down for repairs.

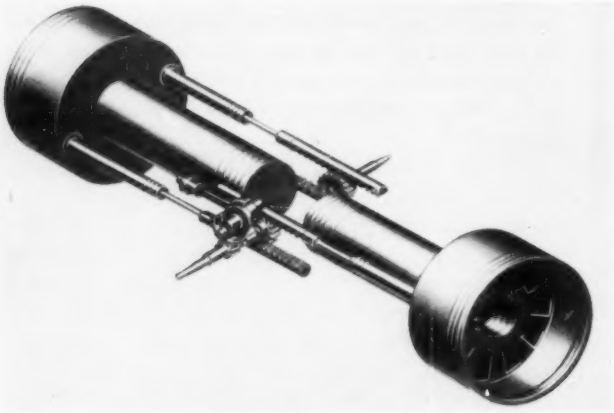
Summary

There isn't much that can be done to get parts and experienced mechanics to these isolated areas in a hurry — but the situation can be eased in several ways. First the engines specified for use in these areas should be as simple and rugged as possible. They should be able to operate under difficult conditions indefinitely with the least possible attention from the inexperienced men available in these locations.

The engine manufacturer should also insist on furnishing an adequate set of spares with each unit which will insure its continuity of service. This should be done over the usual objections of the customer who says he can't afford them. He'll be glad he has them in an emergency — and from the manufacturer's viewpoint he has kept a customer happy and protected the good name of his product.

Fuel oil system in rear of Barro Colorado power plant. Ten 50-gal fuel oil drums are connected as shown to give uninterrupted supply of fuel for two 4-cyl, International Harvester, 15-kw generator sets in plant.





Reciprocating mechanism—heart of free-piston engine

Free-Piston Engine Design Moves Ahead

A case history covering highpoints of a 14-year research program on free-piston engine technology at B-L-H's Hamilton Division. Result—advanced designs.

By: ROBERT S. OGG—Sales Mgr. Special Products, B-L-H Corp., Hamilton Div.

PRINCIPLES are generally simple; it's the practice that takes a lot of doing. Baldwin-Lima-Hamilton's Hamilton Division experienced this during their 14 years of free-piston engine research. Now they have the end result of this project—a competitive product. Perhaps equally important, they have a well-explored and clearly-marked area of knowhow as a base from which to plot future direction of development with reasonable certainty.

What's a Free-Piston Engine

To the diesel man, the concept of the free-piston engine-turbine prime mover needs only a shift in thinking. Turbocharged engines are commonplace and it is pretty well understood how waste energy in the exhaust gas can be converted by the turbine wheel into the work of compressing intake air.

Now, suppose that you design a reciprocating machine in which only enough gas energy is used in the cylinder to compress the air for combustion, overcome friction and drive a few simple accessories. Bulk of the combustion gas energy remains in the exhaust gases. Now you can turn a bigger turbine and you take power for the load from the turbine shaft. It's only a question of how you convert the gas energy to useful work.

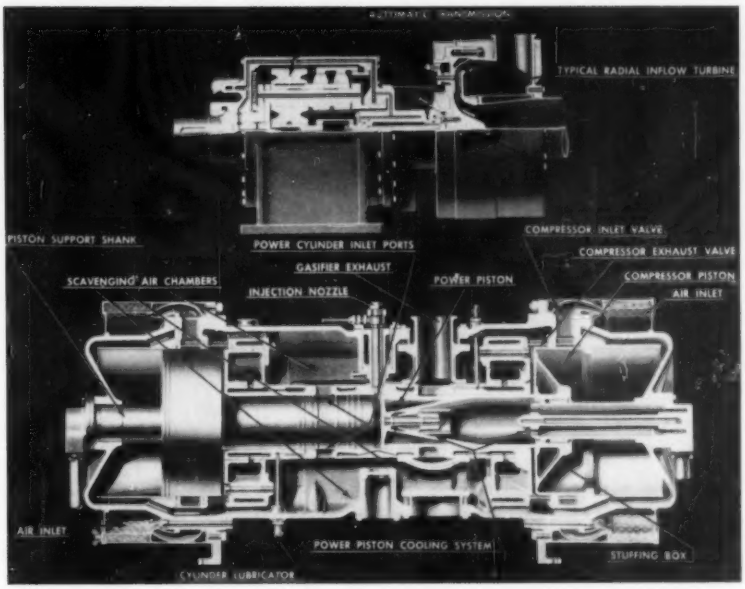
The reciprocating mechanism becomes a gasifier and we no longer need a crankshaft and connecting rods to transmit power. So we eliminate them. To see how this is done, start with the idea of a conventional opposed-piston diesel cylinder. Instead of connecting rods, compressor pistons of larger diameter are attached to the power pistons. Compressor cylinders are built at the end of the power cylinder, replacing the crankcases and crankshafts.

In the diesel, piston relationships are maintained by the rods and crankshafts. In the gasifier, this is done with a simple rack and pinion mechanism, or in some designs, by linkages. Racks are attached to each compressor piston and engage a central pinion shaft. As the racks move in and out with piston movement, the pinions hold the pistons in step. Pinion shaft rotation in alternate directions can be used for certain accessory drives, injection pumps, for example.

As to operation, start with the pistons at inner dead center. Fuel is injected, combustion occurs and the pistons move outward. Air is compressed in bounce chambers and in outward-compressing types, scavenging air is also compressed. The cylinder is designed for uniflow scavenging and so near the end of the stroke one piston opens the exhaust ports, the other, the intake ports.

Scavenging takes place. But now, cylinder pressures are turbine back pressure level. High-pressure air in the bounce chambers expands, pushing the pistons back toward inner dead center on the compression stroke for the start of another cycle. Since there is no rotary movement, rpm is out and frequency of reciprocation is expressed in cycles per minute (cpm).

Gases leaving the exhaust ports have a high energy level and are piped to the turbine for conversion to work. Output of the gasifier is expressed in gas horsepower.



Two-stage, Model FP-165 free-piston engine. Burning of fuel injected into combustion chamber between pistons forces them outward against bounce space air pressure. When bounce space pressure exceeds pressure exerted by pistons, the pistons reverse and move inward toward center. Scavenging air is pumped on both inward and outward strokes. Hot exhaust gases from gasifier pneumatically drive turbine (above) which in turn transmits mechanical power through automatic transmission attached to turbine.

Laying the Groundwork

As you can see, the principle is simple. It would seem that similarity of many gasifier components to diesel counterparts would smooth the path of putting the principle into practice. This is only true to a limited degree. Objectives are quite different.

In the diesel, you want minimum energy escaping in the exhaust gas. Conversely, in the gasifier you want the maximum energy in the exhaust stream to the turbine. So reactions within the two machines are very different. It was necessary to determine characteristics of free-piston machinery before the most practical approach to realizing its theoretical capabilities was possible.

Research has now established the parameters in which future developments must logically progress. In other words, the path has been cleared to machines of advanced design. But what is the goal; what makes this development of free-piston machinery worth while?

Theoretical studies show great possibilities in areas of efficiency, simplicity and power-to-weight ratios. Efficiencies in the diesel range are entirely possible since this machinery retains the diesel principle of combustion at high pressure. An economic factor is the insensitivity of free-piston engines to fuel quality.

Simplicity results from elimination of parts including many of a complex nature. Also, this favorably affects costs. Gas temperatures to the turbine are low enough to stay clear of the need for expensive and hard-to-machine gas turbine alloys.

Power-to-weight ratios are excellent, partly due to elimination of weighty components and partly due to high-output characteristics. As to power delivery, the desirable torque characteristics of turbines are attained.

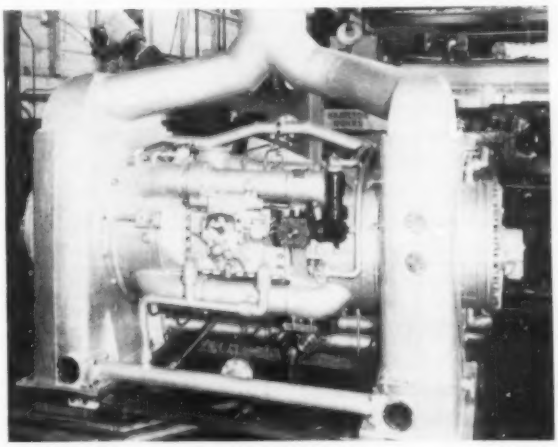
Long life, ease of maintenance, flexibility of gasifier-turbine configuration and location are also promising advantages. To the idea of flexibility can be added the multiple gasifier concept with any reasonable number of units feeding a single turbine. Units can be cut in an out to match the load so as to maintain a high load factor on operating units for best fuel economy.

Development Milestones

B-L-H decided the principles were sound, the advantages significant, and so embarked in association with the U. S. Navy on their long research program. In 1943, a study of operating principles of a free-piston compressor captured by the Navy was undertaken.

Laboratory work showed that this was indeed a new breed of prime mover. Response to controlling factors was considerably different than with diesel engines. Even new technical terms were coined such as "combend" re-

B-L-H Mod DL single-stage, 500-shp gasifier is predecessor to new 2-stage FP-165 above. It is 9½-ft long, 5-ft high, 5-ft wide.



GENERAL (full load operation)	Model A (lab alt)	Model B (sea level)	Model C (lab alt)	Model D (1000 ft)
Gas HP	700(a)	800(b)	980(c)	730(b)
Exhaust receiver pressure, psia	105	125	105	87.0
Exhaust receiver temperature, deg F	1350(a)	1342(b)	1300(c)	1350(b)
Gas flow, lb per min	136(a)	187(b)	218(c)	171.5(b)
Compressor inlet pressure, psia	14.4(e)	14.7	14.4	14.2
Compressor inlet temperature, deg F	80(e)	70	90	130
Nominal stroke (each side), in	10	11	11-1/2	10-3/4
Net stroke (each side) in.	10.03	11.02	11.63	10.75
Piston length overall (each side), ft (d)	3.91	4.45	2.71	2.66
Gas generator weight, lb	11750(a)	13750(d)	6500(d)	
Reciprocating weight, (each side), lb	270(e)	331(b)	------	319(b)
Frequency, cpm	1100(a)	1020(b)	950(c)	937(b)
Mean piston speed, ft per min	1840(a)	1870(b)	1840(c)	1680(b)
Pressure ratio (f)	7.3	7.1	7.3	6.1

Table 1. Data on Models A, B, C, & D gasifiers. Notes: (a) representative of actual laboratory tests; (b) estimated by use of detail calculations; (c) estimated from Model A by use of similitude calculations; (d) from drawings; (e) measured; (f) ratio exhaust receiver pressure/compressor inlet pressure.

fering to the combustion end and "scavend" to the scavenging end of the piston strokes.

Four designs were produced and these can be considered the guinea pigs of the whole project. First there was, appropriately enough, the——

Model A—This machine featured outward compression and had the following dimensions: length—10 ft, 7⅜ in.; height—5 ft, 3 in.; and width—3 ft, 4 in. Power cylinder bore was 7 in., the compressor bore was 21 in. Stroke was 10 in. Other data is given in Table 1. Lessons learned dictated construction of——

Model B—Dimensions in this unit were changed. It had an 8¼-in. power cylinder bore, 23-in. compressor cylinders and an 11-in. full power stroke. It was also outward compressing. A more practical unit than the model A, three machines were built and tested by B-L-H and the Navy Department. Operating data is given in Table 1. New ideas developed led to design of——

Model C—This model, a variation of Model B, never got off the drawing boards. It is significant, however, that by now performance could be predicted with reasonable certainty. This data is also given in Table 1. The next step was——

Model D—Again details were changed but this model had two major differences—it was inward compressing and vertical while the others had all been horizontal. (Table 1).

Table 2 gives Model DL data. Exhaust gas weight is 195 lb per min.

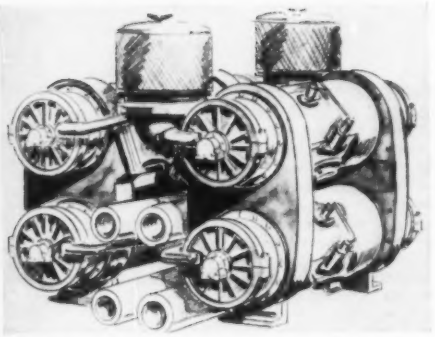
MODEL "DL" CHARACTERISTICS

Overall Dimensions:

Length	Width	Height
9 ft. 6 in.	3 ft. 9 in.	4 ft. 8 in.

Model "DL" Data:

Exhaust Pressure: 62 psig	Exhaust Temperature: 1054° F.	Compressor Inlet Pressure: Atmospheric	Compressor Inlet Temperature: 90° F.
Normal Stroke: 10.75"	Net Stroke: 10.6"	Weight: 7,600 lbs.	Frequency: 1030 cpm
Mean Piston Speed: 1820 ft./min.	Effective Stroke Length: 7"	Power Cylinder Bore: 8" Diameter	G.H.P. 650 (500 SHP)



One possible arrangement—quadruple-stacked Model FP-165 gasifiers develop 1000 shp. Gas from four individual exhaust pipes feeds into the turbine inlet. This unit is 4½-ft long, 3½-ft high and 5-ft wide.

Through testing this unit it became evident that the thermodynamic and mechanical requirements of gasifiers and their reactions to externally-imposed variables were still not completely understood. Practice was not catching up sufficiently to the promise of the principles.

But another milestone had been reached. Belief that proper design of most gasifiers should include inward compression in the compressor cylinders.

Work on the Model D led to this conclusion. Also, this design proved to be so proportioned as to take more advantage of the inherent weight-saving characteristics of free-piston machinery. So while further development was dropped, it served a very useful purpose and became the basis for the present Model DL.

Some Details of the Model DL

Use of inward compression and a patented feature resulted in a major step toward attainment of a practical, reliable gasifier of relatively light-weight and high output. Characteristics are given in Table 2.

This feature was incorporation of a movable compressor cylinder head. It should be remembered that in this type of machinery the length of piston stroke varies with the amount of fuel injected and back pressure, reflecting load. The movable cylinder head was arranged to compensate for differences in "combend" position of piston strokes as they varied with load conditions. This made it possible to hold compressor residual air volume to a minimum while still taking advantage of the lower pressures and larger areas available to inward compressing machines.

While these significant advances were being made, the diesel and gas turbine fields were not asleep. So although the Model DL was a most advanced gasifier, in its naturally-aspirated state it still was not entirely superior to the new crop of highly-turbocharged diesels. It was evident that the gasifier should be supercharged.

This was done by turbocharging and put the gasifier immediately in competition with highly-turbocharged diesels. However, since the Model DL was not originally designed for supercharging, full capabilities of the process could not be realized. But it added to the pool of

knowhow and made possible new designs of lighter weight, higher output and with the reliability of the Model DL.

Model FP-165

In each case, something new was added to the previous model. In the Model FP-165 it was a 2-stage compression principle, unique in the free-piston field. As a result, the supercharged version will be nearly comparable in specific weight and torque characteristics to the open-cycle gas turbine. Predicted economy is equal to, or better than, diesel engines.

This model can be built in turbocharged or naturally-aspirated versions. Both feature the 2-stage compression. The second stage uses energy from the outward piston stroke, thus affording a balance of energies. Power output is raised without excessive stress or heat on compressor discharge valves. Balance is inherent and operation virtually vibrationless so minimum foundation is needed.

The design provides for basic units to be used alone or as multiple gasifiers feeding a single turbine. Unsupercharged shaft horsepower is 125 for a single cylinder and this is doubled with turbocharging. Preliminary studies on marine units are revealing. Total wet weights quoted include turbine and reduction gear (to approximately 2000 rpm).

For 125 shp, the unit will weigh 1464 lb or 11.712 lb per hp. Turbocharged, the same single gasifier unit at 250 shp will weigh 1730 lb and weight per hp drops to 6.920 lb. A 4-gasifier model with single turbine rated 1000 shp will weigh 5075 lb or 5.075 lb per hp.

As an example of size, this 1000-shp unit would be 14-ft, 7-in. long, 5-ft, 5-in. wide and 3-ft, 7½-in. high. These are overall dimensions. Gasifiers are placed side by side at right angles to the axis of drive. However, this is only one of many arrangements, another of which is illustrated.

Estimated specific fuel consumption at optimum conditions is slightly below 0.32 lb per gas hp hr. With multiple gasifiers it is possible to attain this over a wide operating range by selection of the number of units to run.

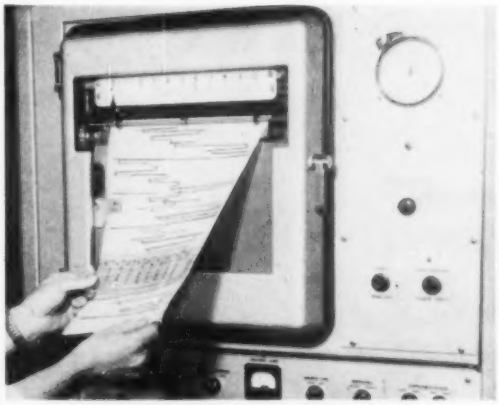
Summary

Free-piston machinery plays in a different ballpark than do diesels. When you go to a new ballpark you first find out the ground rules. That was B-L-H's first job. Now they know how to play the game to best advantage.

Early research led up to development of the Model DL, a very advanced gasifier. It has been built and tested over the past two years and can be produced in quantity for a broad range of applications.

The FP-165 is at the threshold of the future for free-piston machinery. Its design is complete and it needs only production development and engineering to ready it for actual manufacture.

Hamilton Division engineers feel that they now have most of the answers. Also, they feel that the FP-165 comes the closest so far to the realization of the full potential of free-piston machinery.



RR DIESEL WEAR RATE MEASURED IN SECONDS

IT TAKES JUST TWO MINUTES for this device to measure and report rate of locomotive engine wear. It's all done electronically from samples of lube oil.

An aluminum chamber containing the used oil is inserted between electrodes and burned directly in an electric arc. Variations in the light given off produce corresponding changes in the voltage output of an electronic circuit governing the movement of a recording stylus.

Called the Quantometer, this automatic machine is now testing about 130 samples each day from road locomotives owned by the Pennsylvania Railroad. Their former method took five hours to analyze each and every sample.

Before installing the Quantometer, they had to burn each oil sample down to an ash. This ash was then placed in an electric arc between two electrodes. Next, the spectrum of light from the arc containing wave lengths characteristic of any metals present was then recorded on a photographic plate by a spectrograph. Finally, the spectrum image was measured with a densitometer to determine the amount of wear metals in the sample. If results in any given test were inconclusive, they had to repeat the process.

The new device reacts instantly to minute quantities of metal in oil—down to one or two millionths of a gram of metal in a gram of oil. Then it immediately graphs the amount found. Such quick and definitive detection of wear conditions not discovered by ordinary inspection signals needed repair or replacements before costly failures develop.

"An ounce of this preventative maintenance is worth a pound of road delays," says M. S. Penney, PRR enginer of tests, at their Altoona, Pa. laboratory. Warning of wear by the Quantometer saves cost too, of what otherwise would be major repairs.

Large number of various types of diesel-powered construction equipment involved in the excavation of this section of the St. Lawrence Seaway and Power projects is typical of that found throughout the job.

Equipment Servicing—Big Problem on Big Job

Vast amounts of diesel-powered construction equipment are the backbone of work on the St. Lawrence Seaway and Power projects. Units work hard and long—and must keep working to meet deadlines. Preventive maintenance and repair are major problems—especially in the winter. Here's how various contractors on the job beat these problems.

By: ROBERT G. DYMENT

A BIG job is being done up north—and diesels are doing it. And they must keep doing it if the gigantic St. Lawrence Seaway and Power projects are to be finished on schedule. Key to keeping this equipment going under any condition is preventive maintenance backed up by fast service if breakdowns occur. A little background on the vast scope of these projects will give a better understanding of the problems involved.

St. Lawrence Seaway & Power Projects

The projects are mainly excavating and dredging jobs. Though separate, their operations are closely related and coordinated. The power project is a system of dams and channel enlargements for generating more hydroelectric kwh per year than all the TVA powerhouses. The seaway project calls for a system of canals and locks for ocean-going vessels to travel the length of the St. Lawrence River, and via the Great Lakes go as far west as Duluth, Minn.

Over $40 million of equipment is being used on these projects—the majority diesel powered. The need for fast but proper maintenance and repair on this equipment is obvious.

Equipment Maintenance and Repair

An analysis of what contractors are doing to keep this equipment working under difficult conditions with minimum downtime shows that several operating patterns are common to all. These are:

1. Controlled maintenance and repair programs.
2. Centrally-located, fully-equipped repair shops.
3. Qualified and experienced technicians,
4. Adequate parts stock on hand and fast delivery when necessary.
5. Use of mobile maintenance and service units.
6. Service and repair during slack work periods.

With reference to the first item, practically all contractors on the projects adhere strictly to a detailed schedule for cleaning filters, lubrication, lube oil changes, etc. If equipment does break down, the most important units are given top priority in repairing.

Whenever possible, maintenance and repair is done right on the field. However, shops fully equipped to overhaul and repair any size equipment are located within easy reach of the major portion of the equipment. These shops have the necessary qualified technicians with the know-how that gets the jobs done fast and right.

To avoid costly downtime, parts are practically always available right on the job. If not, a part necessary for an emergency job is often flown in to save time.

Service trucks and company cars continually patrol the work area servicing equipment on their schedule as well as caring for any unit in trouble. Two-way radios are used to contact these mobile units and direct them to the scene of trouble if necessary. Operators as well as maintenance crews are alerted to their responsibilities in the overall preventive maintenance problem. Operators must report conditions which require immediate attention of maintenance or service men. If possible these conditions are corrected during slack periods. This is generally during the night so that the equipment will be available for work the next day.

Let's discuss a few examples of how some major contractors are applying these operating patterns to keep their equipment working with minimum downtime.

The Dutcher Construction Corp., excavated the Grasse River Lock, one of two in the Long Sault canal. A fleet of trucks, five draglines, two Marion 111-M's, a Lorain 85, Northwest 80-D and Koehring 1005 were some of the diesel equipment used. Draglines were loaded on 12 C & D Movall wagons and pulled by Cat DW21 rubber-tired tractors and eight Euclid diesel end dumps.

Keeping these vehicles moving and haul roads open over marine clay was very difficult. Three Cat Mod 12 motor graders and some Cat D8's had to be used for this.

Charts were used to show exactly when each piece of equipment needed filters cleaned, lube oil changed, engine overhauled, etc. Major maintenance was done in a fully-equipped 40 x 60 ft shop near the center of the work area. Most of this was handled on the graveyard shift when equipment was idle but some right in the field.

Four lighting plants provided lighting for night work—two Cat 3400, a GM diesel-electric and a Universal gas unit.

Refueling and lubrication were practically non-stop operations. A fully-equipped lube truck in the field caught earthmovers on-the-fly. The truck, a service station on wheels, mounts a Jaeger compressor, fuel tank, water tank and complete pressure lubricating set-up. Qualified mechanics operate it.

To prevent costly downtime, this outfit as well as others make fleet and construction equipment manufacturers rush parts as quickly as possible where needed—by air if necessary. They and many other contractors anticipated parts needs by examining past records and asking fleet operators and maintenance crews which parts needed replacement in the near future. Ordering adequate spares and either replacing an old item or having the necessary part on hand is common practice. This is as much a part of preventive maintenance as a regular program of proper lubrication and equipment adjustment, according to contractors along the St. Lawrence.

In this territory cold weather slows down or halts operations. This is the logical time to make replacements

Cat tractor and Lima shovel, both diesel powered, are seen at work on an open cut through hard abrasive sandstone for a 4-lane highway tunnel under Lower Beauharnois Lock, near Melocheville, Que.

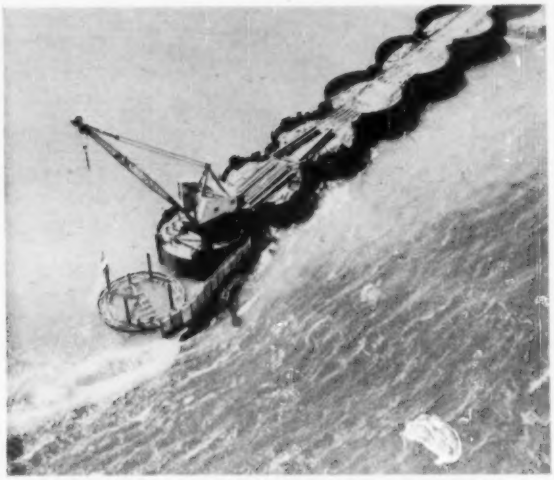
or major repairs on parts ready to give out. Dutcher takes advantage of this lull in work to check for any slightly worn parts too. Replacing these when he can best afford the time will be less costly than during the middle of a tough job.

Let's see how another contractor keeps his equipment moving.

Galop Is., centered in the proposed seaway, was to be cut in half to provide a 1300-ft wide channel. This is one of the largest projects taken on by a single contractor. In this case, C. A. Pitts, General Contractor, Ltd., a division of the Merritt-Chapman & Scott Corp.

On this job, excavated material is loaded into 54 haulage units, 41 of which are Euclids up to 22½ tons in capacity. A fleet of 300-hp Mod 600 Cummins diesel-powered Euclid belly dumps carry the earth ¼ mile to the sides of the island. A fleet of Allis-Chalmers and Cat. scrapers strip the cut area prior to excavation. Twenty one bulldozers and five graders of various makes are also used for general work.

Maintenance work on 650-ton Bucyrus-Erie 450-W walking dragline is done right in field. Three 450-W buckets were always held in reserve. Unit had job of carving 7600-ft section of Long Sault Canal.



Diesel-powered crane drives piles in cofferdam construction.

A 60 x 150 ft shop is equipped with overhead cranes and all equipment needed to overhaul and repair this equipment. The shop area is flanked on one side by the parts department and on the other by a storage area.

Radio contact is maintained between the island and shore base. The mile trip from the receiving building to Galop Island is made by a 40 x 12 ft work boat. The "Pittco", powered by twin 165-hp diesels, makes daily trips carrying parts, supplies and personnel.

Materials are taken to the maintenance, parts and storage building. Because of the time involved in transportation, Pitts probably carries the largest parts inventory of any contractor on the seaway to reduce equipment downtime.

Another contractor Jack & Jim Maser, Inc., has a contract for excavation of 2,575,000 yd of earth and construction of two dike embankments at the Robinson Bay Lock, on the U. S. side of the Seaway. Since every minute counted on this job, with crews working two 10-hr shifts, Maser set up a maintenance and repair shop alongside the main cut. The shop, fully equipped for major overhauls and routine preventive maintenance, was designed for fast servicing. Two self-supporting "Wonder Buildings" were set up side by side. The ends of these buildings are open so that big earthmovers can pass straight through. Self-supporting "Wonder Buildings" are practical solutions to contractors problems of providing adequate servicing facilities in the field.

Three of the eight 35-ton Model B Tournapull rear-dumps used on the Lock Cote St. Catherine excavation are being loaded by a diesel shovel. These diesel-powered units have 27-yd heaped capacity.

Peter Kiewit Sons & Co. and Morrison-Knudsen Co., Inc., were responsible in a joint venture for excavation of nearly 19 million yards of material under two contracts. One contract called for excavation of 12,700,000 yards from a 5-mi section of the Long Sault Canal.

The other contract, a sub-contract for the Long Sault Dam joint venture, involved the excavation of 6 million yards from what is known as Diversion Cut F. Cut F will divert the north channel flow of the St. Lawrence River through the completed half of the Long Sault Dam. This will enable the main channel to be closed off for construction of the other half of the dam.

Digging on Cut F's glacial till was difficult. "This glacial till is the funniest dirt we ever worked in", said one official. "Shovels had to work hard to dig it, yet maintenance of the haul roads made of this material couldn't support the hauling units". From 3 to 4 ft of shot rock had to be used to build roads on top of the excavated glacial till to keep the vehicles moving. Cats had to work continually to maintain the roads.

Construction trucks on this job have been put to tough tests especially during the winter months. Truck bodies had to be heated with exhaust to prevent wet material from freezing in this sub-zero weather.

When a truck or piece of machinery is being operated in mud, clay of gumbo, this material sometimes packs around the equipment. In freezing temperatures the material causes even more trouble in packing. This is generally overcome by periodically driving the truck or tractor onto dry ground and running forward or backward to work off excess mud. If a water supply is handy, a little wash-down of the truck or track group will help. If this isn't possible, a little time spent in removing mud even manually is a good investment.

It isn't unusual for a tractor to freeze on the ground overnight after working under cold, muddy conditions. To prevent this and the resulting damage from breaking it loose in the morning, many maintenance men clean off as much mud as possible. A common way to avoid freeze-in is to park the tractor on logs or even brush to keep tracks out of the mud.

Conclusion

What the above major contractors are doing to keep their equipment in top shape to do the rugged work assigned is typical of other project contractors regardless of size. All realize that the only way to avoid costly downtime is by sticking strictly to a good preventive maintenance program and by fast service in case of breakdowns.

How To Get Quality Fuel - With Economy

Current commercial fuel standards permit the paradoxical situation of supplying a better fuel than needed or asked for while at the same time reducing economy of operation. Here's how and why, along with one engine builder's recommendations on specification changes to improve matters.

By: GILBERT K. BROWER— International Harvester Co.

DIESEL fuels are good—but their specifications are not realistic. Construction equipment operators want economy, with quality. In many areas of this country, Canada and overseas, economical fuels are not being made available to the ultimate consumer. Contrary to the ideas of many diesel engine builders and the users of diesel engines, the laxity of present specification requirements permits the dual-branding of light fuels as heavy fuels and vice-versa. This article shows how excessive the practice of dual-branding has become. A simple, yet realistic, method of eliminating the existent confusion surrounding diesel fuel classifications is endorsed.

For these reasons, the International Harvester Company has for many years:

a. Performed extensive laboratory and proving ground testing of fuels.

b. Conducted cooperative field engineering and service evaluation tests with contractors utilizing many diverse types of heavy equipment.

c. Maintained close liaison with the petroleum industry in order that the mutual adaptation of fuels and engines might best be effected.

d. Participated in the work of fuel and lubricant technical committees of the several professional societies and research councils.

Work of this type is constantly conducted in order that we may be kept alert to the needs and desires of users of International construction equipment.

Commercial Specifications

At present there are four types or grades of fuels generally available on a commercial basis to operators of diesel equipment; namely, Grades 1-D and 2-D Diesel Fuels and No. 1 and No. 2 Burner Fuel (furnace) oils. Table 1 lists the ASTM (American Society for Testing Materials) specification requirements governing these fuels.

What do these requirements indicate and how do they compare to characteristics of fuels now being marketed? The following factors will become self-evident as we study the available data:

1. Contractors are paying premium prices for fuel quality not required by their equipment.

2. Construction equipment is being operated at lower power or with increased fuel consumption, and hence higher operating cost than necessary. This is due to the use of fuels dual-branded over too wide a range.

3. Current commercial fuel specifications are unrealistic, thus forcing the majority of equipment and engine manufacturers into the untenable position of having to develop and issue their own fuel specifications.

4. With minor revisions to present specifications, realistic, and usable, commercial diesel fuel specifications can be developed. The equipment and engine manufacturers could then recommend their use to the construction and industrial machinery operators.

What can and should be done in order that quality—plus economy in fuels may be obtained by contractors throughout the U. S. and the world?

TABLE 1

Current Commercial (ASTM) Specifications

Grade NO's.	ASTM D-975 - Diesel Fuels		ASTM D-396 Burner Fuels	
	1-D	2-D	1	2
Distillation Temps., °F, Max.:				
10% Point	—	—	420	—
90% Point	—	675	—	675
End Point	625	—	625	—
Viscosity, Kinematic, Centi-stokes:				
at 100°F, Min.	1.4	1.8	1.4	—
at 100°F, Max.	—	5.8	2.2	4.3
Sulphur, % by wght, Max.	0.50	1.0	—	—
Cetane Number, Min.	40	40	—	—
Flash Point, °F, Min.	100 or legal	125 or legal	100 or legal	100 or legal
Water & Sediment, % by vol. Max.	Trace	0.10	Trace	0.10
Carbon Residue on 10% Residuum, %, Max.	0.15	0.35	0.15	0.35
Ash, % by wght, Max.	0.01	0.02	—	—
Pour Point, °F, Max.	**	**	0	20*
Copper Strip Corrosion, Max.	No. 3	No. 3	No. 3	—
Gravity, Deg. API, Min.	—	—	35	26

* Shall not require lower than 0°F

** 10°F below ambient

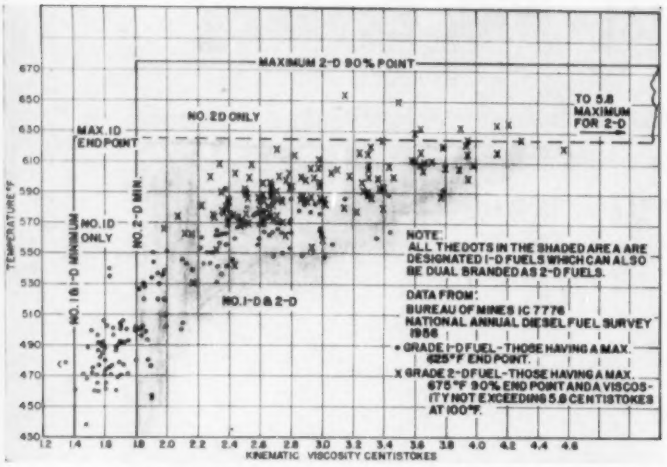

MAXIMUM 2-D 90% POINT
NO. 2D ONLY
MAX. ID END POINT
TO 5.8 MAXIMUM FOR 2-D
NO. ID ONLY
NO. 2-D MIN.
NO. I-D MINIMUM
NO. I-D & 2-D
NOTE:
ALL THE DOTS IN THE SHADED AREA ARE DESIGNATED I-D FUELS WHICH CAN ALSO BE DUAL BRANDED AS 2-D FUELS.
DATA FROM:
BUREAU OF MINES IC 7776
NATIONAL ANNUAL DIESEL FUEL SURVEY 1956
• GRADE I-D FUEL - THOSE HAVING A MAX. 625°F END POINT.
X GRADE 2-D FUEL - THOSE HAVING A MAX. 675°F 90% END POINT AND A VISCOSITY NOT EXCEEDING 5.8 CENTISTOKES AT 100°F.
TEMPERATURE °F
KINEMATIC VISCOSITY CENTISTOKES

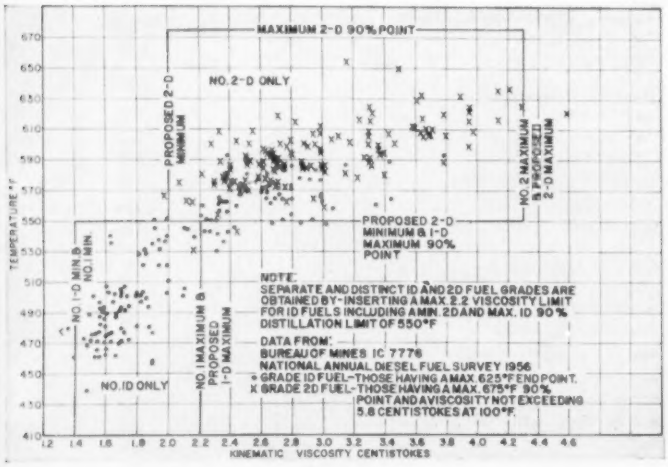
Fig 1A. Viscosities and 90% distillation points of 316 1-D and 2-D Diesel Fuels are plotted to show how 68% of fuels designated as 1-D may be dual-branded under present specification limits.

Fuels Available

First, let us discuss characteristics of fuels now sold in the U. S. The best sources of such data are the information circulars issued annually by the Bureau of Mines. Following comments are based on a study of 550 samples of 1956 diesel and burner fuel analyses obtained and collated by Bureau of Mines and published in their Information Circulars 7776 National Annual Diesel-Fuel Survey, 1956 and 7762 National Survey of Burner Fuel Oils, 1956. The fuels were manufactured by approximately 49 petroleum refining companies, large and small, in 123 refineries throughout the country and in Canada. These data show that all samples met the requirements of commercial (ASTM) specifications, within the limits of test repeatability and reproducibility, except in a few unimportant instances.

In essence, then, fuels of satisfactory quality—but not necessarily economical fuels—are readily available for use in high-speed diesel engines. For economy in both operation and maintenance, minor revisions to the present ASTM D-975 Diesel Fuel Classification requirements are needed in order to assure procurement, of fuels suitable for city-bus operation as well as for trucks, tractors, and similar service.

Fig 1B. By proposed changes, most dual-branding would be eliminated. Limiting factors would require all fuels falling in rectangular area to be single branded as 2-D Diesel Fuels.


MAXIMUM 2-D 90% POINT
NO. 2-D ONLY
PROPOSED 2-D MINIMUM
NO. 2 MAXIMUM IS PROPOSED 2-D MAXIMUM
PROPOSED 2-D MINIMUM & I-D MAXIMUM 90% POINT
NO. I-D MIN. & NO. I MIN.
NO. I MAXIMUM & PROPOSED I-D MAXIMUM
NO. ID ONLY
NOTE:
SEPARATE AND DISTINCT ID AND 2D FUEL GRADES ARE OBTAINED BY INSERTING A MAX. 2.2 VISCOSITY LIMIT FOR ID FUELS INCLUDING A MIN. 2D AND MAX. ID 90% DISTILLATION LIMIT OF 550°F
DATA FROM:
BUREAU OF MINES IC 7776
NATIONAL ANNUAL DIESEL FUEL SURVEY 1956
• GRADE ID FUEL - THOSE HAVING A MAX. 625°F END POINT.
X GRADE 2D FUEL - THOSE HAVING A MAX. 675°F 90% POINT AND A VISCOSITY NOT EXCEEDING 5.8 CENTISTOKES AT 100°F.
TEMPERATURE °F
KINEMATIC VISCOSITY CENTISTOKES

Specification Revisions Needed

In the following discussion, specification requirements covering flash point, water and sediment, carbon residue, ash, pour point and copper strip corrosion are not discussed. These requirements are easily being met, they are providing the desired qualities, and there is little conflict as regards the requirements between diesel fuels and burner fuels. Diesel fuels do have minimum cetane and maximum sulphur values not required by burner fuels, whereas, the latter fuels have minimum initial boiling point and gravity limits not required by diesel fuels.

Primary discussion will center around the 90% distillation temperature, viscosity and gravity requirements; their present and proposed limits; and their effects as regards diesel fuel technology.

Diesel Fuels—Present

Fig. 1A, plotting the 90% distillation points and the viscosities of the 316 Grades 1-D and 2-D Diesel Fuels, shows how 68% of the fuels, designated as Grade 1-D by the vendors, may, under present specification limits, be dual-branded and sold as 2-D fuels. This is indicated by the dots in the shaded area of Fig. 1A.

Thus the fallacy of an equipment manufacturer advising his customers to just "request these heavier fuels be supplied" for economy is forcefully illustrated. Under these conditions fuels are sold to contractors which result in power losses or decreased fuel economy due to inherently low heating valves.

Diesel Fuels—Proposed

Fig. 1B illustrates how excessive dual-branding of 1-D and 2-D Diesel Fuels may be eliminated by three minor changes to the ASTM Classification. One would change the 2-D minimum viscosity from 1.8 to 2.0; one would add a 1-D maximum viscosity limit of 2.2; and the other would add a 2-D minimum and 1-D maximum 90% distillation temperature requirement of 550°F. Thus all fuels of typical 2-D characteristics would be truly labelled as Grade 2-D and those very light and volatile fuels of lower energy content could be sold only as Grade 1-D. These proposed limits will:

1. Stop 21%, or nearly one-quarter, of Grade 1-D fuels from being sold as the heavier 2-D Grade, which is the practice at this time. See shaded area of Fig. 1A.

2. Require 43% of Grade 1-D designated fuels to be single branded as 2-D fuels. These fuels are represented

by the dots in the upper rectangular area of Fig. 1B.

3. Require very slight modifications to less than 5% of the fuels in order that they may fit into the new limits.

It should be noted, then, that present unnecessary, undesirable, and above all unrealistic dual-branding of 1-D and 2-D fuels can be readily corrected and simply brought into line with practical requirements.

For sake of simplification and to provide a 1-D fuel suitable for inter-city bus operation, a 90% maximum distillation temperature of 550°F has been indicated (with an optional waiver to a 500°F maximum for intra-city service) instead of the present 625°F maximum end point. This latter requirement is approximately equivalent to a 590°F maximum 90% point. This suggested change will not, as can be noted, effect availability of any plotted 1-D fuel. Also, in order to maintain as close a relationship as possible with burner fuel specifications, Grade 2-D maximum viscosity limit is proposed as 4.3 instead of 5.8. Only one fuel lies outside this limit.

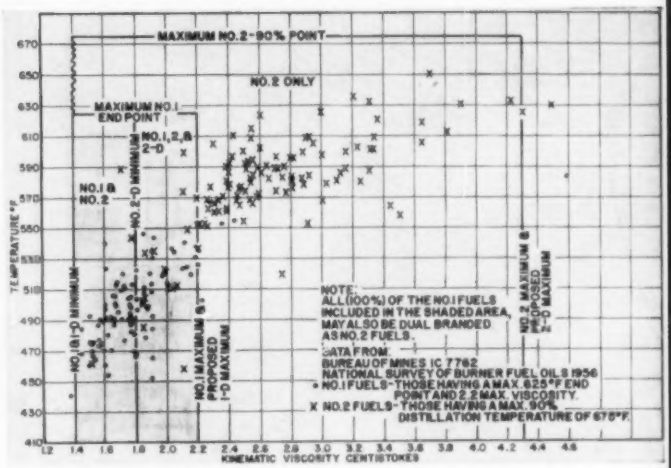

MAXIMUM NO.2-90% POINT
NO.2 ONLY
MAXIMUM NO.1 END POINT
NO.1,2,& 2-D
NO.1 & NO.2
NO.2-D MINIMUM
NO.1-D MINIMUM
NO.1 MAXIMUM & PROPOSED 1-D MAXIMUM
NO.2 MAXIMUM & PROPOSED 2-D MAXIMUM
TEMPERATURE °F
KINEMATIC VISCOSITY CENTISTOKES
NOTE:
ALL (100%) OF THE NO.1 FUELS INCLUDED IN THE SHADED AREA, MAY ALSO BE DUAL BRANDED AS NO.2 FUELS.
DATA FROM
BUREAU OF MINES IC 7762
NATIONAL SURVEY OF BURNER FUEL OILS 1956
• NO.1 FUELS - THOSE HAVING A MAX. 625°F END POINT AND 2.2 MAX. VISCOSITY.
X NO.2 FUELS - THOSE HAVING A MAX. 90% DISTILLATION TEMPERATURE OF 675°F.

Fig 2A. Viscosities and 90% points of 234 Grade No's 1 and 2 Burner Fuels are plotted to show how dual-branding is allowed.

Burner Fuels

Since there are strong economic forces tending to favor manufacture and sale of burner fuels for diesel use, it is most desirable that specifications for both types of fuel be kept in as close a relationship as technical considerations allow. Figs. 2A and 2B pertain specifically to burner fuels and their comparison to diesel fuels just discussed.

Fig. 2A is a plot of the 90% points and viscosities of 234 Grade No.'s. 1 and 2 Burner Fuels within the framework of the present ASTM Burner Fuel specifications. But, observe that present limits will:

a. Permit 100% of the No. 1 fuels to be marketed also as No. 2 Burner Fuels. This may be acceptable to the usual consumer of burner fuels. This certainly is not acceptable to construction equipment operators; particularly so, when 100% of one grade of fuel may be dual-branded as another grade.

b. Permit 39% of the No. 1 fuels to be sold as Grade 2-D Diesel Fuels (providing their cetane number is 40 or higher). This indicates, of course, a definitely unsatisfactory possibility with respect to the use of No. 1 Burner Fuels as Grade 2-D Diesel Fuels since undesirable dual-branding of light, low-energy fuels as a heavier grade 2-D fuel is condoned. The possibility, as previously stated, is, to say the least, of questionable virtue.

c. Of the fuels stated to be Grade No. 2, 9.7% should in reality be classified as No. 1 since they have API gravities greater than 35, 90% points less than 625°F, and viscosities less than 2.2 centistokes at 100°F.

The 90% temperatures and viscosities of 234 Burner Fuels are plotted in Fig. 2B within the limits of the present No. 1 Burner Fuel and the proposed Grade 2-D Diesel Fuel specifications. This again illustrates how extreme dual-branding of fuels may be eliminated with minor effects on fuels being supplied to the commercial market. Also this figure shows how burner fuels can readily be manufactured for use as diesel fuels of satisfactory grade requirements. The majority of burner fuels appear to meet such requisite conditions.

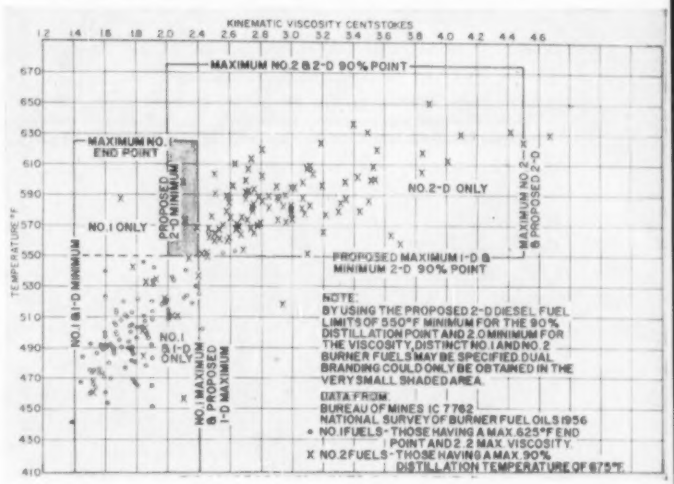
Summary

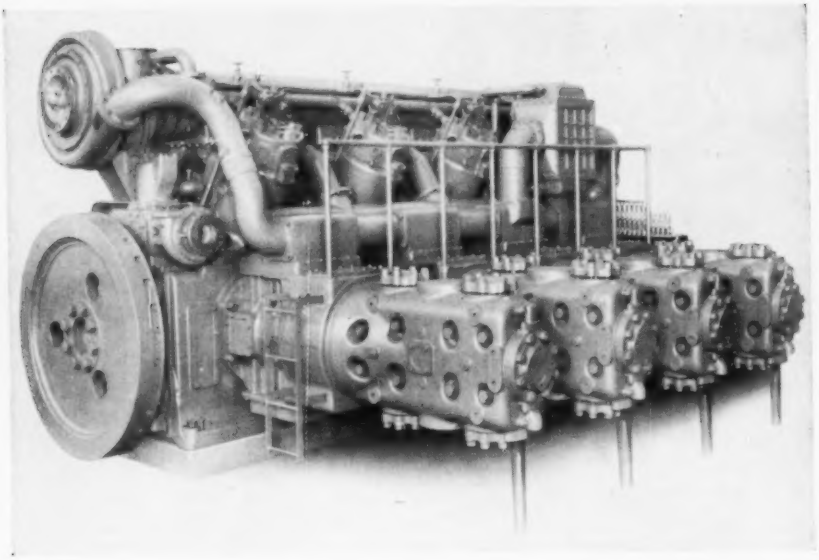
Figs. 1A and 2A point out how, under present specifications limits, excessive dual-branding of fuels is not only permitted but is being practiced.

Figs. 1B and 2B show how simple dual-branding may be controlled and how fuels now available commercially fall into the proposed revisions with little effect on fuel technology and supply. It should also be observed how

(*Continued on Page 73*)

Fig 2B. In proposed method of controlling dual-branding of Burner fuels, only those in shaded area could be dual-branded.


KINEMATIC VISCOSITY CENTISTOKES
MAXIMUM NO.2 & 2-D 90% POINT
MAXIMUM NO.1 END POINT
PROPOSED 2-D MINIMUM
NO.2-D ONLY
NO.1 ONLY
PROPOSED MAXIMUM 1-D & MINIMUM 2-D 90% POINT
NO.1-D MINIMUM
NO.1 & 1-D ONLY
NO.1 MAXIMUM & PROPOSED 1-D MAXIMUM
MAXIMUM NO.2-D & PROPOSED 2-D
TEMPERATURE °F
NOTE:
BY USING THE PROPOSED 2-D DIESEL FUEL LIMITS OF 550°F MINIMUM FOR THE 90% DISTILLATION POINT AND 2.0 MINIMUM FOR THE VISCOSITY, DISTINCT NO.1 AND NO.2 BURNER FUELS MAY BE SPECIFIED. DUAL BRANDING COULD ONLY BE OBTAINED IN THE VERY SMALL SHADED AREA.
DATA FROM
BUREAU OF MINES IC 7762
NATIONAL SURVEY OF BURNER FUEL OILS 1956
• NO.1 FUELS - THOSE HAVING A MAX. 625°F END POINT AND 2.2 MAX. VISCOSITY.
X NO.2 FUELS - THOSE HAVING A MAX. 90% DISTILLATION TEMPERATURE OF 675°F.

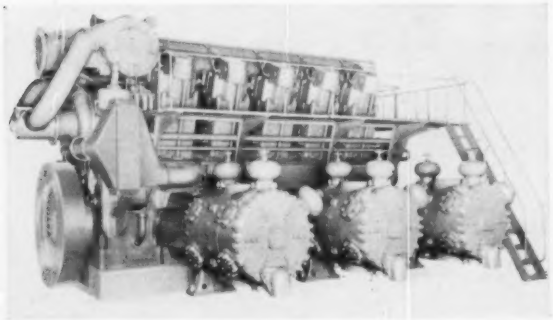


Parallel turbocharging system is seen on Cooper-Bessemer type GMXF, 8-cyl, vee-type engine. The all-exhaust-driven turbocharger at upper left complements existing scavenging pump at upper right.

Field-Conversion Kits Turbocharge C-B Engines

Low cost power boost in Cooper-Bessemer engine-driven compressor — plus cut in fuel consumption — are results of turbocharging with simple conversion kits in field.

Series turbocharging system on Cooper-Bessemer type GMWC, 10-cyl, vee-type engine-driven compressor. In this system, turbocharger at upper left is always assisted by engine-driven blower.



SIMPLE conversion kits are uprating Cooper-Bessemer engine-driven compressors in the field. The boost in output is substantial and for relatively low cost. Plus this, fuel consumption is improved considerably.

Two types of field-conversion kits have been developed for converting existing C-B 2-cycle engines. One type provides a "parallel" turbocharging system, the second a "series" turbocharging system.

The parallel type of turbocharging system was developed specifically for Cooper-Bessemer GMXA, GMXD, GMV and GMV-FT engines. It is an all-exhaust-driven turbocharger auxiliary that complements the existing engine reciprocating scavenging pumps (Fig. 1).

The series-turbocharging kit was designed for the later model C-B engine-driven compressor such as the GMVA and GMWA units. It is an all-exhaust-driven turbocharger introduced into the engine air intake system as a first stage of compressions (Fig. 2).

With the series-turbocharging arrangement, an engine-driven blower is used for second-stage compression. The engine is not completely dependent on exhaust energy for its supercharging effect during starting or at any partial load. It is supercharged from the moment it starts as well as throughout all speeds and loads. (See DIESEL POWER, Dec. 1956 and April 1957) This results in maintaining high efficiency even at fractional loads.

With either the parallel or series-turbocharger system the engine is completely self-starting and sustains itself at all loads. There is no need for mechanical-disconnect devices or couplings for starting and running at partial loads.

Basically, C-B's field conversion kits provide a more abundant supply of cool, clean air for scavenging the cylinders and for combustion of fuel. The net effect is to make it possible to burn more fuel efficiently thus producing more power per stroke.

The completely-integrated conversion kits have been designed and are now being built for all current vee-angle, C-B, 2-cycle engines. They are a direct outcome of a long-range research and development program on engine turbocharging.

The major objective of C-B engineers' original design program was to develop a successful integrated engine auxiliary that could be mounted directly on older 2-cycle engines. They foresaw the present trend to modernize and uprate existing engines to increase their output. So they concentrated on perfecting a unit that could be applied to *both* new and existing engines.

The recent introduction of complete field-conversion kits provides a simple and economical method for uprating engines. In addition to higher output, it has produced substantially higher fuel economy over present C-B engines. As a result, savings in space, foundations, and attendant labor are likewise substantial.

Note the 22% to 50% horsepower boosts on engines listed in the accompanying table. The potentials of getting additional power with the same equipment is readily apparent.

Increases in horsepower that can be expected are:

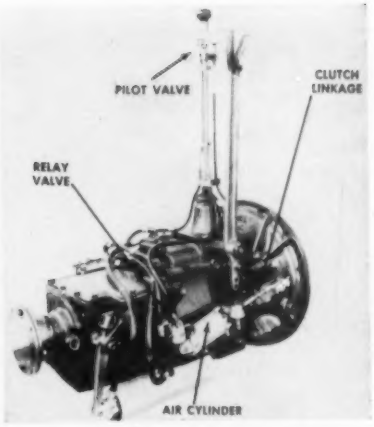
Engine Type	Former HP per Cylinder	New HP per Cylinder	% Increase
GMXA	62.5	78	25%
GMXD	66	82.5	25%
GMV	100	135	35%
GMV	100	150	50%
GMV-TV	110	135	23%
GMV-TF	110	150	35%
GMVA	135	165	22%
GMVA	135	180	33%
GNW	250	350	40%
GMWA	250	350	40%

In addition to increased horsepower, these field conversion kits provide the uprated engines with even greater overload capacity than was previously possible. All engines used to be derated for altitude. Now these same engines with turbochargers modified for altitude, pull their full sea level ratings up to 7500 ft.

Engines modernized with these kits also have higher thermal efficiencies. Because of better conversion of heat to usable power, fuel consumptions as low as 6900 Btu/hp/hr can ge guaranteed. Lower waste heat, of course, means less cooling equipment and in many cases, engines uprated to new horsepower can operate with their higher outputs without additions to existing cooling systems.

The fact that the turbocharger converts formerly wasted exhaust energy into usable power is especially significant to the economy-minded operator. It is estimated that over 2½ million horsepower in the field could profitably use the additional horsepower and fuel economy now possible with conversion kits like those described.

Depending upon the size and type of engine, field conversions can be made in 4 to 7 days with relatively simple asssembly or skills.



Air-Powered De-Clutch Takes Work Out of Gear Shifting

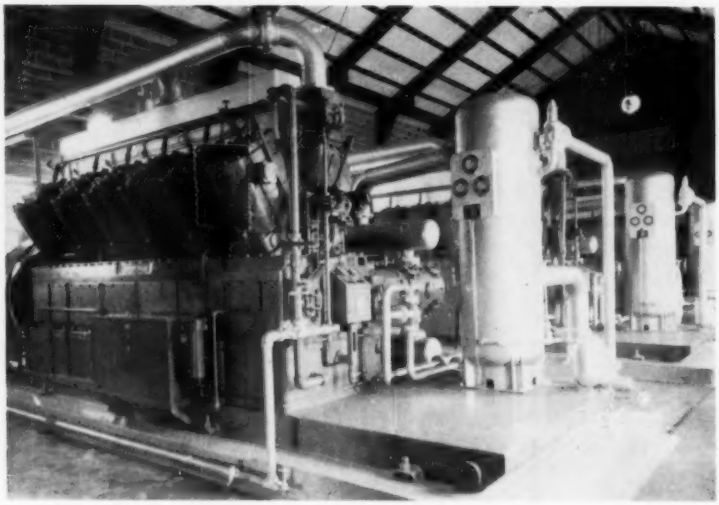
NOW you don't have to use the clutch pedal when shifting gears in Fuller Mfg. Company's Road Ranger transmission while vehicle is moving forward. A new "Air-Power De-Clutch" system releases and engages the clutch. This, as well as double clutching, is done automatically at the right time when moving the shift lever for gear engagement.

The "Power De-Clutch" works from the vehicle air system. It includes only a pilot valve, relay valve, and air cylinder connected by the required lines and clutch linkage. As the pilot valve, on top of the gear shift is operated air flows through it, opens relay valve, then flows to the cylinder lined to the clutch pedal shaft. Movement of the piston releases the clutch. When pilot valve is closed, cylinder is exhausted and clutch is re-engaged.

The pilot valve has a gear shift lever grip and an actuator hinged against spring tension to permit valve opening by a slight forward or backward movement. Spring tension holds the actuator in a neutral or closed position. Engine speed is adjusted to the new ratio to be engaged while the shift lever is in the neutral position.

The new system may be used in all shifting situations where the vehicle is moving forward. It may also be used to release the clutch before starting the vehicle—but the clutch pedal must be used to engage the clutch as the vehicle is put in motion in forward or reverse. This is an advantage at stop streets and lights.

Power De-Clutch is available as factory equipment on models R-46, R-96 and R-960 RoadRanger Transmissions. It may also be obtained in kit form for field installation on these units equipped with either conventional lever or remote control.



Each of the three Ingersoll-Rand units consists of a 12-cyl, vee-type, SVG gas engine driving a 4-cyl, 2-stage horizontal compressor. Cuno and Peco lube oil filters, American Bosch magnetos, Crosby pressure gauges and Beaird intake scrubber are also seen.

Gas Stored Underground — Gas Engines Put It There

Laclede Gas Co. of St. Louis makes its own local gas well for storing natural gas underground to meet winter's peak demand for heating St. Louis homes.

HERE'S a switch—Ingersoll Rand engine-compressors are pumping natural gas back underground. Ridiculous? Residents of St. Louis don't think so. This gas is being stored underground for their winter's heating needs. It's a unique application for the three 660-hp, 12-cyl, vee-type, SVG gas engines doing the job.

Up to 16 million cu ft of gas a day delivered by pipeline from Louisiana are compressed to 655 psi by these units. The gas is pumped down 1400 to 1500-ft wells into a natural underground dome and trapped by rock and water until needed during cold weather. More than 4 billion cu ft of gas are already stored underground. Geologists estimate there's room for 50 billion cu ft.

Underground gas storage does not affect surface use of the land. And it isn't new, many companies have used former gas fields for this purpose. But the Laclede Gas Co. was one of the first to trust hundreds of thousands of dollars of gas to a water-bearing formation that never held gas before.

Increased service potential to the public justified this gamble. The company was heating 100,000 St. Louis homes with natural gas and another 100,000 wanted service. Unfortunately, the heating load required high volume for a relatively short season. Cost of doubling the pipeline supply to meet this seasonal peak would be prohibitive. Above-ground storage tanks also would cost too much. Both would raise consumer rates too high.

The answer was natural underground storage — but no exhausted gas fields were available. However, an area 18 miles north of St. Louis was discovered where a dome of porous sandstone ¼ mile down was sealed above and below by impervious layers of shale and at the circumference by salt water. A series of shallow wells drilled in 25,000 acres of this area proved the land structure to be as required.

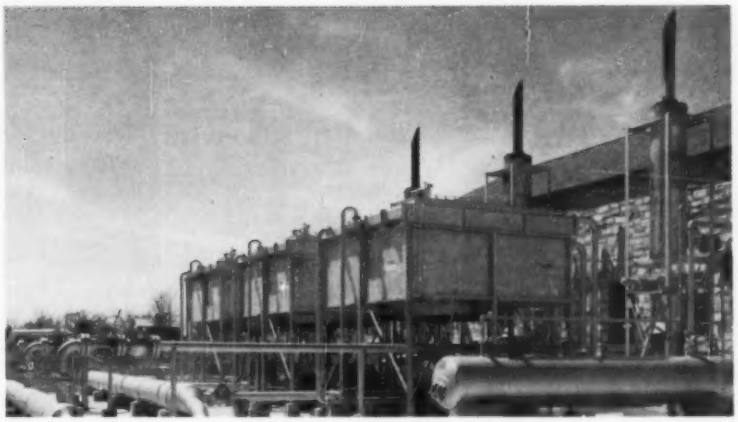
Additional tests showed the cap rock would hold the gas in. When all tests proved successful, Laclede leased storage rights but agreed not to use any mineral or potable water bearing strata.

Compressor Station Operation

Construction of injection wells and a compressor station was started in February, 1955. The first gas was pumped down into four wells in December 1955. Five wells were added in 1956 and five more are being drilled. A total of 20 wells are contemplated.

To raise gas to required injection pressure, each of the three I-R 11¾-in. bore by 12-in. stroke gas engines drives a 4-cyl, 2-stage horizontal compressor. The compressor has two 10-in. by 12-in. first stage cylinders and two 5½-in. by 12-in. second-stage cylinders.

Gas reaching the compressor station through lines extended from the city distribution system passes through a scrubber, then an orifice and recording meter to the 24-



Natural gas, engine cooling water and lube oil are cooled in these Young fan-cooled radiators. Fans are driven by hydraulic motors. Maxim exhaust silencers and American Cycoil air filters are seen at right. Nordstrom valves and Nooter starting air tank are also visible.

in. intake manifold. An 8-in. line carries gas from the manifold through a scrubber to the first-stage compressor cylinders. Then gas goes through a fan-cooled radiator, another scrubber and the second-stage compressor cylinders. After passing through the cooler again, gas flows through a 6-in. line to the 20-in. discharge manifold and through a series of lines to the injection wells.

An I-R centrifugal pump, chain-driven off each engine, circulates cooling water through engine jackets and radiator. Another engine-driven pump forces lube oil through the engine-compressors, clay and waste-packed filters, and the cooler. Radiator fans are driven by hydraulic motors powered by pumps vee-belted to sheaves on the end of each engine crankshaft. Jacket water and lube temperatures are controlled automatically by thermostatic valves.

Fuel gas is taken from the incoming line after the first scrubber. It is passed through a separate displacement meter to measure fuel consumption for the plant. Starting air is provided by a pair of I-R compressors.

Average gas pressure to compressors is 50 to 125 psi. The first million cu ft were injected at 670 psi, just 100 psi above the original field pressure. Laclede's engineers intend to reduce this differential and lessen injection pressure as gas volume increases. Currently, injection is continuous at 655 psi as long as gas is available. The only interruption comes during cold weather when home heating demand equals or exceeds pipe line supply. At this time gas feeds back to city distribution lines.

Compressor station capacity is 16 million cu ft per day. Actual injection volume is regulated by discharge pressure. With more wells in service, the field is expected to accept a greater volume of gas at lower pressure. Additional compressor capacity may be required at a later date.

The company expects to withdraw about 100 million cu ft a day during the 1957-58 Winter with a possible total withdraw of a billion cu ft for the season. This will increase substantially as additional householders are permitted to install gas heating equipment. Gas withdrawn from storage is reduced to 150 psi and passed through a gas-fired heater to maintain a discharge temperature of 70°F. At each well head there is Christmas tree with hand operated valves and an orifice meter run and recording meter. There is a cross-over line at the manifold so that gas can be metered on either injection or withdrawal.

Conclusion

For Laclede, successful development of the underground storage project means expansion of sales potential. For St. Louis customers, reliable operation of the I-R units means clean, convenient, economical gas heat for cold weather.

Major Equipment List

Engine-Compressors	Ingersoll-Rand Co.
Scrubbers	J. B. Beaird Co.
Intake gas cleaner	Blaw-Knox Co.
Recording meters	Bristol Co.
Lube oil filters	Perry Equipment Corp.
	Cuno Engineering Corp.
Fuel meter	Emco Inc.
Magnetos	American Bosch Arma Corp.
Cooling water pumps	Ingersoll-Rand Co.
Coolers	Young Radiator Co.
Hydraulic Fan Motors & Pumps	Denison Engineering Co.
Exhaust silencers	Maxim Silencer Co.
Air filters	American Air Filter Co.
Lubricating oil	Standard Oil Co. (Ind.)
Starting air compressors	Ingersoll-Rand Co.
Starting air tank	Nooter Corp.
Thermostatic valves	Fulton Sylphon Div.
	Robertshaw-Fulton Controls Co.
	Amot Controls Corp.
Pressure regulators	Fisher Governor Co.
Gas Heater	Black, Sivalls & Bryson, Inc.

Gas enters storage area through these lines. Blaw-Knox gas cleaner, Bristol recording meters, Fisher pressure regulators and Black, Sivalls and Bryson gas heater (at right) are seen in the system.

Two technicians are seen in their respective bench areas. Note the special tools mounted on the boards in front of the men. Similar benches and tool boards are located along three walls and back-to-back in the center of this room where injectors, pumps and governors are inspected, dismantled and assembled. Disassembled parts are placed in trays such as one at lower left.

Personnel are seen cleaning pump, injector and governor parts in the parts wash room. If inspection after disassembly shows parts to be worth reclaiming they are brought into this room in trays. Parts are cleaned in air-activated washer, wet sand blaster or buffing machines seen here. Heavy-duty exhaust fan removes fumes through exhaust outlet over all pieces of washing equipment.

Talking Shops

Here are highlights developed in an interview with the owner of a leading fuel injection service shop—Diesel Injection and Service, Inc., Norfolk, Va. They are a big outfit now—but it wasn't always this way. We dug up what they consider to be the major reasons that made them grow and extend their operations to cover three states. And there is no copyright on these ideas.

DIESEL Injection Sales and Service, Inc. covers a big area. Its main shop in Norfolk, Va., and branches in Salem, Va., Raleigh, N.C., and Charlotte, N.C., along with a proposed branch in Richmond, Va., serve North and South Carolina and Virginia.

The main shop in Norfolk, the one we'll discuss, has 15 technicians, parts personnel and an office force. All work in separate air-conditioned, temperature-controlled rooms. All have adequate space. Herb Wittersheim, the owner, will tell us about their widespread operations.

"Herb, most complaints we hear are about lack of space. You have plenty. Was it planned?"

"Right from the beginning we planned to have adequate space. Now as we grow we're not cramped. But we need all the space we have. We're franchised by practically all American as well as several European injection equipment manufacturers. Plus this we're fully equipped to service the fuel systems of engine manufacturers who build their own. We also service hydraulic governors. Hundreds of these injection pumps, nozzles and governors go through our shop each month."

"What do you think is the reason for your growth?"

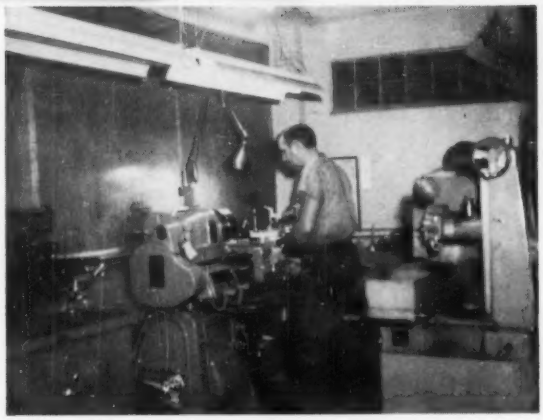
"There is no one particular reason. It's a combination of five things—a large stock of parts, fast service, our exchange system, specialized machinery and instrumentation, and factory-trained competent personnel."

"Let's take these in order. What about parts?"

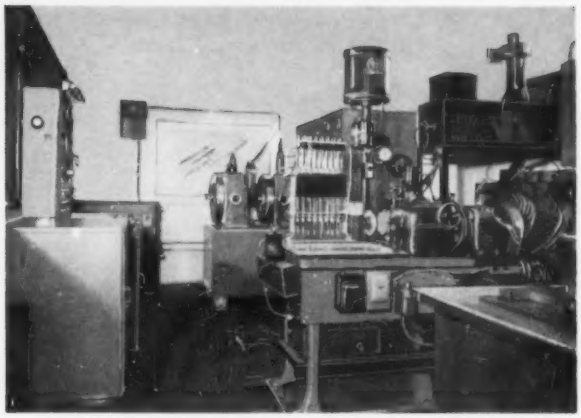
"Our customers know they can get anything they need at once from our large stock. And if we don't have it we get it immediately, especially if it's an emergency. I'll explain how we do this when we talk about fast service, however we seldom run out of parts.

"We generally have a 90-day supply on hand. This is based on present knowledge of prospective jobs, plus past records which take into consideration lead time in getting these parts from the manufacturer and seasonal demands. Our system for maintaining this stock is controlled by a set of stock record cards. Each card lists the part name and manufacturer's number, its location, amount on hand, and minimum and maximum to be stocked. A daily record of parts used in the shop and sold over the counter is transferred to the stock card.

"Colored tabs are put on card edges to show if stock is normal, under, or overstocked. If understocked, an order is immediately placed and when item is received, card is corrected. Overstocking happens when an item is not moving as fast as figured. For example, a customer may switch to another make of equipment and this changes the demand pattern of parts used."



Section of machine shop shows milling machines, lathe, surface grinders and precision plunge OD grinder. Parts found to need machining after inspection and cleaning are brought to this department. Technician is setting up operation on lathe.



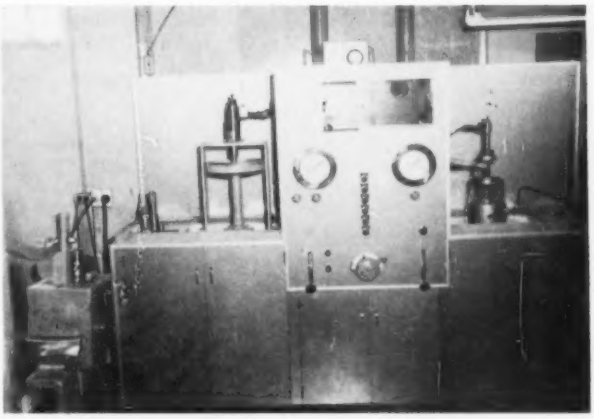
Woodward governor test stand at left has been modified so that hydraulic governors such as Marquette, Farris Pickering, etc., can also be tested. Shop-built test stand for calibrating individual-type pumps is at upper right. By cam changes, various size pumps made by American Bosch, Fairbanks-Morse, Bendix Scintilla, etc. can be calibrated. Calibration is checked against master pumps. American Bosch calibrating stand seen at lower right has been modified to handle various multi-cylinder type fuel injection pumps.

"Do you stick to stocking only fuel injection and governor parts?"

"No. We stock a complete line of accessories to give an overall service that ties in with injection systems. For example, these include many makes of fuel filters, miscellaneous gaskets, starting fluids, flexible hose, brass and steel fittings, etc. Also some engines parts such as bearings and reconditioned cylinder heads. The supply on hand and method of control is the same for all parts."

"Herb, getting to the next point, just what do you mean by 'fast service'?"

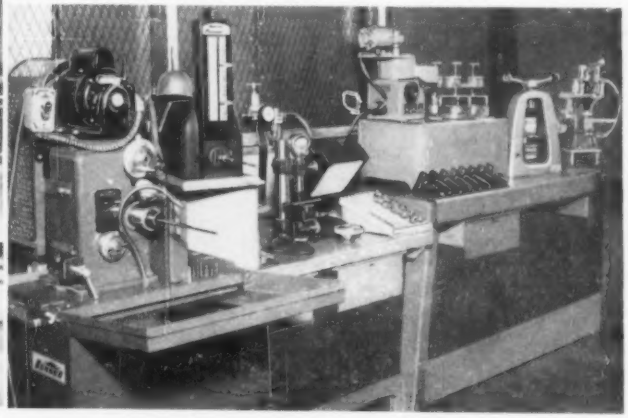
"It involves several phases, all centered around the use of our company airplane. Three of my diesel technicians and I fly this plane. It's used mostly for emergency purposes. For example, if a customer on a rush job is stuck for parts or for a mechanic to work on the injection

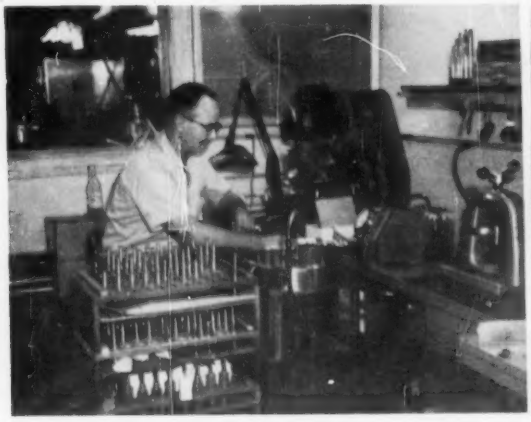


Shop-built GM unit injector test stand activates and flow tests GM injectors. Two units can be tested at same time. Injectors made by Caterpillar, International Harvester, Cummins, Cleveland Diesel, etc., are also handled by changing adaptors. Master injectors of each specific make are used to check accuracy of the stand.

Some of the precision equipment used in the EMD injector reclamation department is shown grouped on one bench. From left to right are a Sunnen honing machine for honing barrels; Sheffield air gauge for checking barrel straightness and diameter; Swedish comparator for checking plunger dimensions, Monochromatic flatness tester for checking flatness of lapped surfaces; flat lapping machine for production lapping of reclaimable parts; hydraulic plunger and barrel leakage fixture; and device for activating GM 71 injectors.

Manual and hydraulic testing equipment for checking leakage past nozzles, and plungers and barrels is located in one room. Test stand at left activates smaller nozzles. Nozzles are activated to assure complete removal of lapping compound before testing and to check if needle breaks through newly case hardened seat. By simulating actual operating conditions before and during testing, later failure of operation and complaints are eliminated.





Technician in EMD reclamation department remates and refits the plungers and barrels seen in special rack at left. Sunnen honing machine, lapping machine, air gauge and hydraulic leakage factor used by the technician for this purpose are seen in this photo (from left to rotate) on the bench in front of him.

Technicians at the other end of the EMD reclamation room are working on flat lapping and rotary lapping machines, monchromatic flatness tester and surface analyzer for checking surface finish on plungers and barrels. Competent technicians can operate any of the precision equipment in this department.

system, we fly to him. This may save him a day or so of downtime.

"If we don't have the specific part needed, in our stock here, we either fly to one of our branches to get it or wherever else we can pick it up. Our customers really appreciate this and are willing to pay any extra cost involved.

"I also use the plane to coordinate servicing among the branches. If I had to drive from one branch to another it would take too long. This way I can hit several or sometimes even all of them in one day and still get something done at each.

"One other use we have for the plane is that of flying to meet prospective customers to discuss a job and possibly close a contract with them. Taken together, these uses of the plane add up to a great saving in time. Another thing that is a real time-saver and could be discussed under fast service is our exchange system. But to us it's much more than that and stands on its own feet."

Work forms are typical of the 25 or 30 used in the shop. Their use cuts time in recording data, reduces chance of errors, and facilitates ordering and billing of customers.

SERVICE REPORT BOSCH APE-B

Received from _____ Order # _____
Address _____ Date _____
Pump Designation _____ Serial # _____
The following parts have been used in the repair of this fuel pump:

Quantity	Part #	Nomenclature	Horiz.	Vert.	Rad.	Price	Total
		Plunger & Barrel					
	CV 76119A	Breather cap	U320	4-A	3-F	3.05	
	FI 765	Petcock,oil leakoff	R6905	5-A	5-C	.80	
	FI 7621	Petcock, bleeder	R6253	5-A	5-H	1.30	
	ZPU82R17	Hand fuel pump assy.	U324	10-JK	25-LL	24.55	
	GA 7610	Gasket, barrel loc.	R6702	5-A	5-K	.10	
	GA 7617	Gasket, copper,insp.	R6702	6-G	5-a	.10	
	GA 76153	Gasket, trans.pump	JR 1B	GB	GB	.10	
	GA 76134	Gasket,insp.cover	JR1B	GB	GB	.40	
		Gasket, end plate	GB1B	GB	GB	.12	
		Test Record of Woodward Electro Hydraulic Governor					.10

EMD #8137674

Woodward 360072
Test per SP 85

Serial No. _____ Date _____ Tested by _____

1. Tested with SAE 30 Oil at 180°F.

Control Position	Nominal Speeds	Tolerance Bracket	Actual Speed Increasing	Actual Speed Decreasing
Idle	300	298-302		
2	382	367-397		
3	464	449-479		
4	545	543-547		
5	627	612-642		
6	709	707-711		
7	791	789-793		
8	873	871-875		

2. a. Pilot valve comes to "MAX.Field" at idle and 1/8" power cyl. _____
b. It comes to "0" at Step 8 and 11/32 gap _____
c. Over-riding cylinder lifts load control p.v. above 1/8" mark instantly _____
d. Maximum to minimum time(should be less than .027) 0. _____ minutes.
(95-105 psi supply pressure)
e. Minimum to maximum time (should be .05 to .08) 0. _____ minutes
(95-105 psi supply pressure)
3. a. Bearing oil failure system trips at _____ psi at idle(3 to 5).
b. Bearing oil failure system trips at _____ psi at Full Speed(14 to 16).
c. Time delay at Idle 0. _____ minutes(Should be .58 to .75).
d. Trips instantly at Step 2
e. Signal switch operates _____

"What is this exchange system?"

"With this system, a customer brings in his worn or damaged equipment and picks up a guaranteed reconditioned replacement over our sales counter.

"Here on these shelves are some injection pumps, injectors and nozzle assemblies of various makes—some new and some reconditioned. In an emergency, when a customer gives us his worn pump or injector he doesn't have to wait for it to be repaired. We just lend him a replacement unit from these shelves until his unit is repaired.

"We both gain by this system. We recondition and test his unit when we have many of the same type on hand—a sort of mass-production deal. Test equipment can then be set up once and have a long, smooth run through it on a production-line basis. This lowers reclamation costs and keeps a steady flow of work through the shop. The customer in turn benefits by our lower production costs plus cutting his engine downtime to a minimum. If he had to wait until his pump was reconditioned, his engine might be down for a week or more."

"What about the fourth item contributing to your growth—specialized machinery and instrumentation?"

"The reconditioning and testing equipment we use here is generally more extensive than that used in most modern

A perpetual inventory is maintained of over 19,000 individual items stored in parts department. A 90-day supply is generally kept on hand. Plus fuel injection and governor parts, a complete line of accessories is also stocked that ties in with injection systems and gives overall service.

shops. We've also modified much of it—in some cases for greater accuracy, in others to get broader use of the equipment. Plus this, we've built a lot of our own equipment.

"The great number and variety of units we work on influences the location of this equipment and how we use it. It is distributed in six rooms. For example, there is the inspection, assembly and disassembly room. Here, pumps, nozzles and governors are inspected and disassembled. This room has a number of benches each equipped with the special tools, etc. for working on a specific make unit. The technicians at each bench are kept busy all day working on this specific type unit. For example, our EMD injector reclamation program calls for about four men working continuously on reconditioning unserviceable plungers and barrels which we get from many railroads. We use the finest optical measuring equipment, lapping machines, comparators, calibration stands and surface analyzers for remating and refitting these plungers and barrels.

"After disassembly the parts are taken in trays to the cleaning room. If necessary, some parts are taken to the machine shop after they're cleaned. If not, they are assembled. Then the units go to their respective testing rooms. Pumps and governors to one room, nozzles to another. Each of these rooms is staffed with technicians who do the testing."

"Finally, Herb, what about the last reason you gave for your success—your men. Are they all factory-trained?"
"Of course, some of them don't have to be. But as many as possible go to several manufacturer's service schools. Those that go then teach the others so that almost all can handle any job competently. No matter how much work a shop may have or how modern their equipment is, if you don't have the trained technician to do the job right you may as well give up. They're the men who carry the ball."

Tractor Diesel Tops Million Miles - Still In Top Shape

OVER one million miles without a major breakdown. That's the outstanding record of a GMC 4-cyl diesel-powered highway tractor. And it was done without a single accident.

At last count, the tractor, operated by Bekins Van & Storage Co. of Los Angeles, Calif., had rolled 1,018,707 miles in less than six years with the original crankshaft, block and gear train. This performance has won it the name "Little Jewel".

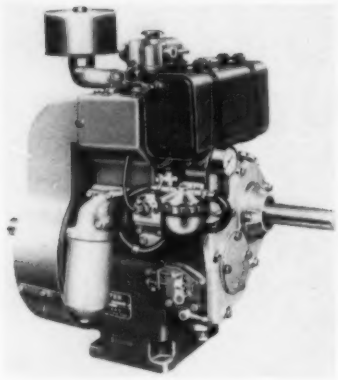
The Little Jewel has made history at Bekins since being purchased from GMC Truck and Coach Division in December, 1950. She has cost her owners less than a dime a mile for maintenance, depreciation, fuel, oil, tires and tubes, according to C. W. "Clint" Holeman, fleet superintendent for Bekins. This is 6 cents below the diesel average.

She has gained the respect of everyone—owners, mechanics and drivers. Drivers say it is a good unit to operate because it has sufficient power to perform the job assigned, it's comfortable to ride in, easy to handle and runs practically trouble-free.

Bekins management has found this tractor to be unusually fine from an economic standpoint. It has operated so efficiently, that during the million miles of operation, the cost per mile has been 0.038 cents. This included repairs, paint, washing, lubrication, and its proper portion of overhead created by maintenance shops and facilities. This is far below the average.

Tractors generally wear out several engines in a million miles according to Holeman. But the engine in the Little Jewel has never been changed and to date the main and connecting rod bearings are only 0.002-in undersize. This indicates there has been very little wear on this crankshaft even at this mileage.

The answer, says Holeman, is that this tractor was well built, had proper preventive maintenance with frequent lubrication and oil changes, expert driving and handling, and a good run.



Petter's New "PC" Line of Engines

Built in single to 4-cyl models, new air-cooled engine line features high power to weight ratio and good applicational flexibility.

"CUT the weight, increase the horsepower." This must have been the mandate to Petters engineers. It is exactly what they have done in their new "PC" line of small air-cooled diesels.

There are good reasons for emphasis on these two points. The small diesel's principal competitor in this country is the light, air-cooled, relatively-cheap gasoline engine. The diesel's horsepower-to-weight ratio and cost per horsepower have been both a physical and economic handicap that has somewhat hindered their application.

Now, distinct improvement in power-weight ratio is represented by this new engine line. And higher specific outputs generally reduce cost per horsepower. So the gap is being narrowed and the advantages of diesel power can be spread to many new applications.

PC models are built by Petters Ltd. in England and are distributed here by their American affiliate, Brush ABOE, Inc. They will be available through the latter's distributors in this country.

PC's come in 1 to 4-cyl models, all built around the same power assembly. This means that a good many parts are interchangeable throughout the series. Cylinders, heads, pistons, connecting rods, valve gear, etc. are common. Problems of ordering and stocking parts are simplified for users and also the manufacturer.

Brush ABOE has worked hard to provide good service and parts facilities. The factory in England is helping by a new system of pre-packaging. Stress is placed on ease of identification and packaging to give complete protection against dampness, dirt and damage. For example, steel parts are lanolin-coated and vacuum-sealed in polvinyl-chloride bags.

Engine Data

All engine models are air-cooled. A flywheel fan cools the PC-1; all other models use an axial-flow fan. Cooling is more than adequate for the conservative ratings.

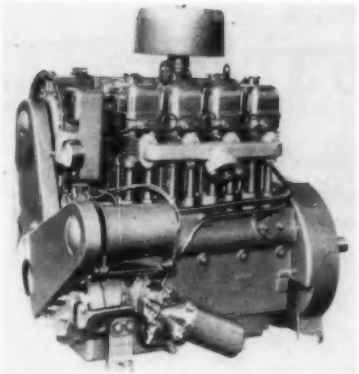
Each cylinder is rated 5 hp at 3000 rpm (1500-fpm piston speed). Bore and stroke are both 3-in. It should be noted that BS 12-hr ratings are used and therefore the 5 to 20-hp range of the four models is an easy gait for continuous operation.

As to weights, they run 243, 329, 439 and 503 lb respectively for the 1 to 4-cyl models. This is a considerable reduction from earlier units. According to Petter spokesmen, further reduction through use of lightweight metals is in the wind. Recently-purchased production machinery has dual cutting speed ranges to exploit fully the free-machinability of light metals.

In the meantime, let's look at some design features that enable these units to surpass competitive gasoline units in economy of operation and length of service life.

All components are rugged enough to stand the pressures and temperatures of the high-compression operation

Applications such as the PC-1 driving 13,000 gph self-priming centrifugal pump at left and PC-2 powering ½ cu yd dumper at right, as well as many others, have been used to test new PC series for two to three years.



PC-1 at left is smallest of Petter's new engine series and PC-4 at right is largest. New series includes 2 and 3-cyl engines as well. All are air-cooled, high-speed, lightweight diesels ranging from 6.25 to 25 hp at 3000 rpm.

that makes diesel economy possible. An open combustion chamber is used. Intake valves are larger than the exhaust valves for better breathing and they have integral shrouds to promote air swirl for better combustion. Bryce injection equipment is used throughout.

Full pressure-lubrication supplies oil to all rubbing parts. A full-flow filter keeps the oil clean and a gear-type pump maintains the pressurized supply. Multi-cylinder models have an oil cooler mounted in the cooling air stream.

Precision-type copper-lead bearings are used on both the mains and connecting rods. The mating journal surfaces on the counterweighted crankshaft are induction hardened. So are the cam faces on the camshaft. Both crankshaft and camshaft have a bearing between each cylinder, assuring rigidity.

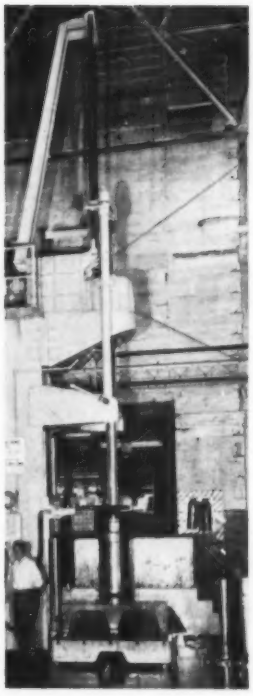
In view of the varied applications envisioned, attention was given to (a) dirtproofing, (b) ease of maintenance and (c) adaptability. Dirtproofing includes elimination of any exposed working parts and filtration of air and fuel entering the engine. Accessibility to all items requiring regular servicing is the key to easy maintenance. Included, too, are simplicity of construction and use of precision components such as the bearings mentioned.

To provide for adaptability, different arrangements of rotation and drive are possible. For example, there are five variations of the PC-1, including drives at half engine speed from a camshaft extension. A variety of clutches and gear boxes are available and all models can be provided with standard SAE flanges.

Summary

The PC line of engines is another example of how builders of small diesels are narrowing the gap between these units and competitive gasoline engines in many respects. They are getting so close that any cost and weight differentials can be offset by performance, economy of operation and long service life. Figured on the basis of overall cost of ownership, they present a more attractive proposition every day.

TALL HONE PREPARES LINER SURFACES FOR QUICK BREAK-IN



ONE ENGINE MAKER goes to great lengths to insure proper cylinder liner wall finishes for optimum break-in performance. They've discovered the advantages gained are worth it.

At Cooper-Bessemer Corporation, for instance, this towering hone, which cost more than $50,000, is just part of their precision finishing program. It handles honing work up to 36-in. inside diameter, 96 in. long with an outside diameter of 76 in. Its capacity is 39-in bore and 108-in. stroke.

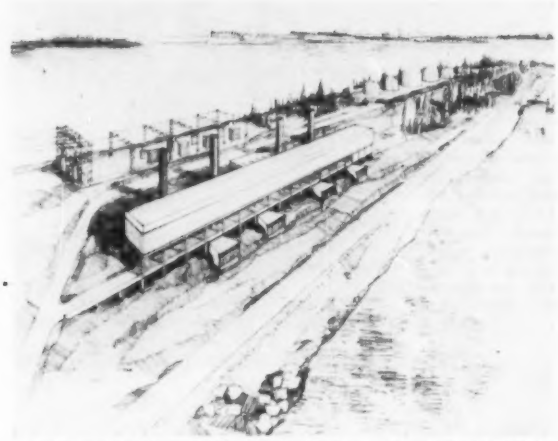
The vertical machine is the handiwork of designer Chester Schlicht and methods engineer R. Veatch. Built right in the Cooper-Bessemer Grove City, Pa. plant, the hone towers 33½ ft and tips the scale at 70,000 lb. It was developed specifically for honing large cylinder liners used in gas, diesel and gas-diesel engines ranging up to 5000-hp output. A 4-speed electric motor drives a honing spindle at speeds varying from 600 rpm to 1800 rpm.

Now in full operation, quality of the work realized by the new hone has enabled Cooper-Bessemer to get even better results in properly preparing liner surfaces. This operation ties in with the benefits already gained from their studies of break-in using radioactive oil techniques.

Such emphasis on proper preparation of liners is extremely important for all cylinders — whether huge or small, new or reconditioned.

Gas Turbines Picked For Canadian Plants

By: W. J. GRANBERG



Architects' drawing of British Columbia Power Commission's 80,000 kw plant. Transformers are behind plant, fuel tanks at right.

CANADA'S Province of British Columbia can lay claim to having two of the largest gas turbine electric power plants in the world. Last fall, the British Columbia Power Commission put their 80,000-kw plant on the line. This plant was the first of its kind in the province and at the time reportedly the largest in the world.

The "largest" record is soon to be broken when the British Electric Power Company, Ltd. puts its 100,000-kw gas turbine plant in service. Completion is scheduled in 1958.

The Commission's Georgia generating plant is situated at Bare Point, near Chemainus, on the Strait of Georgia. This is 50-miles north of Victoria on Vancouver Island. It was built at a cost of approximately $13,300,000. It is expected to operate at near capacity for three years, or until the hydro-electric system is capable of handling the power demand. From then on it will be used only for peaking or in the event of low water. Unless abnormal conditions develop, it is thought that the turbine plant will operate at no more than 25% capacity after 1960.

Four General Electric gas turbine generating units are installed. Two are simple-cycle, single-shaft units, each having a rating of 26,500 hp or 19,750 kw. The remaining two units are of the regenerative cycle type with two shafts and are rated 24,000 hp and 18,999 kw.

These will be oil-fired. Storage tanks are provided for 250,000 barrels, or a 6-week supply. Equal storage is provided for diesel fuel, Bunker C and for treated oil. The Bunker C is treated with magnesium sulphate (Epsom salts) to neutralize harmful metallic components. It is estimated that 3000 ton of salts will be used yearly in this treatment to eliminate risk of corrosion.

Completion of this project was another milestone in the Commission's development of facilities to meet growing electrical demands in the area. In addition to this and its hydro-electric plants, it also has 32 diesel-powered generating plants employing a total of 104 engines.

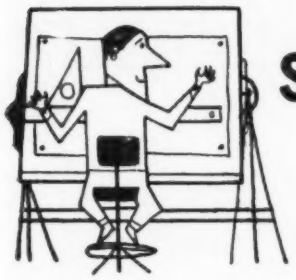
It is interesting to note the differences in the two gas turbine plants that are only 40 air-miles apart.

British Columbia Electric's plant will have four 25,000-kw turbine-generator units supplied by Brown-Boveri of Switzerland. In fact, the entire installation is virtually a Brown-Boveri package deal, with that firm also supplying such equipment as transformers, circuit breakers, switch gear, etc. They will also provide supervisory personnel and labor for the installation.

Natural gas is the fuel to be used. It will reach the plant through a 12-in., 4-mile pipeline from the company's main line in the Fraser River valley. Each turbine is expected to consume about 400,000 cu ft per hr or something like 38-million cu ft per day. As an indication of what this volume means, the entire city of Vancouver uses 12-million to 15-million cu ft per day.

Oil will be used as standby fuel. In view of the plant's size, storage capacity is 3 1/2-million gal. Yet despite its size, the plant is expected to be used as a standby unit, used for backing up the hydro-electric system and for peaking when necessary.

Excavations show where three of the four natural gas turbines will be located in the 100,000 kw British Columbia Electric plant.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

New Seal Cement For GM "110" Fresh Water Pumps

A new seal cement, "Pliobond 20", is now being used in production to cement the rubber seal ring and the carbon seal to the pump body of Series 110 fresh water pumps. The adhesive quality of this cement has proved very satisfactory.

When at a later date, it becomes necessary to replace the rubber seal ring and carbon seal in a water pump where "Pliobond 20" has been used, it may be necessary to pry out or knock out the seals.

It is very important to maintain proper retention of the carbon seal and the rubber seal ring to the pump body. This can be accomplished when the adhesive is used as follows:

1. Remove all scale, adhesive, grease and moisture from the counterbore for the seal in the pump body.

2. Coat the rubber seal ring seating surfaces of the carbon seal with adhesive.

Be sure the lapped surface of the carbon seal is free of adhesive.

3. Install the rubber seal ring onto the carbon seal.

4. Coat the rubber seal surfaces within the pump housing with adhesive.

5. Install the rubber seal ring and carbon seal into the pump housing.

6. Immediately install impeller and seal assembly onto shaft using tool 5990.

Note: The adhesive should set-up under the spring load exerted by the seal assembly. Therefore, steps 2 through 6 once started, should be completed with a minimum of delay.

GLOW PLUG NOZZLE
PART NO. 69215

SPARK COIL NOZZLE
PART NO. S-2981

Cummins Preheater Spray Nozzles

There are two preheater spray nozzles now in current use, Part No. S-2981, for the spark coil system and Part No. 69215 for the glow plug system. These two nozzles cannot be interchanged without creating a starting problem.

If you use the S-2981 nozzle with the glow plug there is danger of flooding the glow plug. Likewise, use of the 69215 nozzle with the spark coil system does not supply enough fuel.

The two nozzles can be identified by the numbers stamped on them. See sketches.

Check for the correct nozzle when you encounter a hard starting problem. Also, check your stock nozzles to make sure they are not interchanged.

Greasing Crankshaft Rear Cavity on GM "71"

To prevent abnormal crankshaft thrust washer wear, the crankshaft rear cavity of Series 71 engines should be filled only 1/3 full with a non-fibrous-type grease.

Overfilling the crankshaft rear cavity will result in a pre-load occurring when the power take-off assembly is attached to the engine. This pre-load not only overloads the clutch drive shaft bearing, but also the seal of the pilot bearing and crankshaft thrust washers and could result in serious engine damage.

Starting IH Engines with Manifold Air Heater

It has been the practice of some operators to use a starting fluid containing ethyl or straight ethyl ether to aid in starting direct-starting diesel engines in cold weather. However many of the 300 and 350 series International Harvester diesel tractors in the field are equipped with an electric manifold air heater as an aid in starting in cold weather.

Starting fluid containing ethyl or straight ethyl ether should never be used in conjunction with the electric manifold air heater as this is extremely dangerous.

It is imperative that all personnel who operate 300 and 350 series diesel tractors be cautioned never to use ethyl ether and the electric manifold air heater in combination for starting these engines.

Maintenance on Cat Starting Engine with Common Lube Oil System

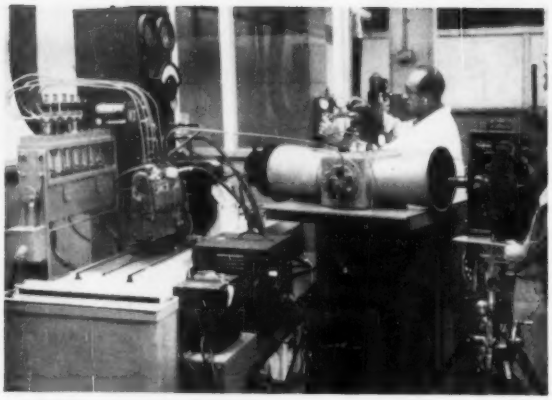
Maintenance of the starting engine and diesel on machines with a common lube system is only slightly different from the maintenance required on those with the individual starting engine and diesel lube systems. With the common lubricating system, the following maintenance procedure should be observed.

1. Fill both the starting and diesel engines to the correct level with the same type and grade oil.

2. Check the crankcase oil levels on both engines before starting. Maintain oil levels at "full" mark on gages.

3. Drain both the starting engine and diesel crankcases at the interval recommended for the diesel in the operation and maintenance instructions for your machine.

news of our industry



High Speed Movies Make Nozzle Analysis Easy

Fuel injection nozzles in action are hard to observe. But with ultra high speed motion photography provable records can be studied at length. That's the method they're using at American Bosch Division, American Bosch Arma Corporation in their research and development program. Their cameras catch the fast action—about 30 injections each second at pressures up to 10,000 lb per sq in.

Here's how it's done at the Springfield, Mass. lab. Test stand fuel injection pumps are set up to inject fuel into a nozzle incorporated in a specially-built pressure chamber. Simulating a diesel high compression combustion chamber, the sealed container (center) has windows for lights and camera.

By varying chamber density, effect of compression pressures on spray pattern and penetration are filmed. Differences produced by changing nozzle orifice diameters, lengths, angles or other variables are also recorded and analyzed in relation to design and application problems. With the permanent camera record, any characteristic can be quickly reviewed or demonstrated.

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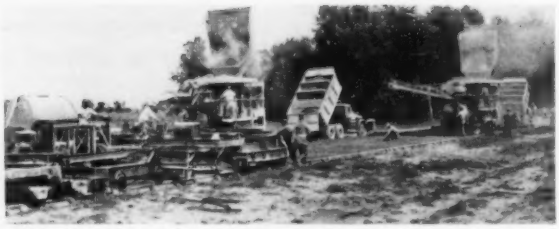
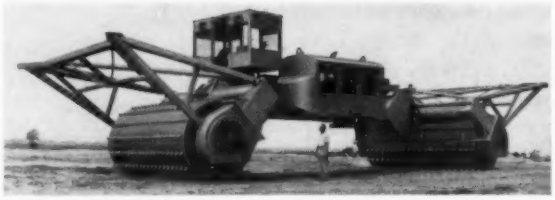


Detroit Diesels Pave the Way

Going north from Milwaukee, US 141 is under construction. When completed, this 4-lane highway will serve as a main artery for north and south traffic. Cape & Sons Construction Co. are using two Chain Belt Rex dual drum pavers to lay pavement. Both pavers are powered by GM Detroit Diesel Series 71 engines. The unit in the foreground driven by a 3-71 lays the finished surface after the other Rex with 4-71 lays the first layer.



Giant Eats Its Way Through Jungles

Size of this huge diesel-electric tree crusher can be gauged by the operator it dwarfs. It is powered by a 600-hp diesel which drives a LeTourneau generator. This is the third such mighty machine built by R. G. LeTourneau, Inc. One is now ripping right-of-way for a road through the jungles of Peru. This one cleared 1500 acres of scrub forest near Carthage, Tex. for a reservoir. The third is undergoing tests at LeTourneau's 12,000-acre proving grounds.

Weighing 140 ton, only one man is needed to feed power and steer with electric push-button controls. The giant measures over 73 ft long by 22 ft wide and 19 ft high. The 9-ft front roller climbs trees for leverage to push them over. Then the ax-like cleats chew up the trunks and brush for burning or easy disposal. The unit can eat its way through an acre of woods every 15 minutes.

Historic M-A-N Diesel Gift to Museum in Japan

Magokichi Yamaoka, president of Yanmar Diesel Engine Ltd., bowed low in thanks for the historic diesel given to him by Ulrich Neumann, director of M-A-N. Also present at the ceremony in the Augsburg works was Japanese Ambassador, Ryuji Takeuchi.

The veteran engine, dating back to 1899, will now take its venerable place in the Osaka works museum in Japan. This 1-cyl model rated 20 hp at 180 rpm was the tenth diesel produced by M-A-N.

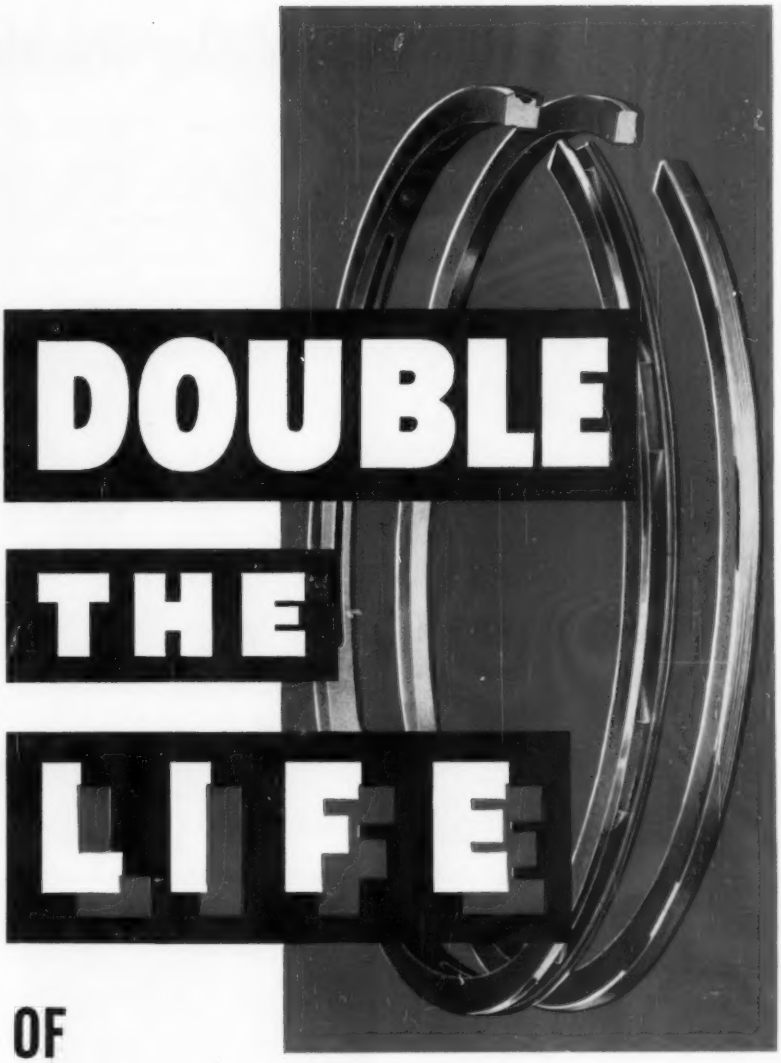
It first saw service in a safe factory in Wurttemberg 58 years ago. In 1911 it was returned to the Augsburg works for reconditioning. It continued in operation until 1937 when it was reacquired by its maker for the M-A-N museum.

DEMA Election

Members of Diesel Engine Manufacturers Association have elected Guy J. Coffey president. Mr. Coffey, now president of Chicago Pneumatic Tool Company, made a rapid rise after joining this firm in 1933 as a salesman. In 1945 he was appointed vice president of sales and then was elected president in 1953.

Elected vice presidents of DEMA are William E. Butts, president, General Metals Corporation, and John MacKendrick, president Clark Bros. Company.

Re-elected treasurer is Robert H. Morse, Jr., president, Fairbanks, Morse & Company. Robert L. Stanley of Falls Church, Virginia, continues as executive secretary of the association.



OF CYLINDERS, PISTONS AND RINGS!

Perfect Circle piston rings are plated with thick wear-resisting solid chrome that *more than doubles* the life of cylinders, pistons and rings. Records prove PC Chrome-Plated piston rings give more hours of sustained power...more hours between overhauls.

Leading diesel manufacturers use Perfect Circles as original equipment and recommend them for replacement service because they know Perfect Circles can be depended on for top performance under the most grueling conditions. Many types of Perfect Circles, designed specifically for diesel applications, are available.

The Perfect Circle engineering staff will gladly assist you with your piston ring problems...no obligation of course. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., 888 Don Mills Road, Don Mills, Ontario, Canada.

PERFECT CIRCLE

PISTON RINGS

More people prefer Perfect Circles than any other brand!

Dependable, Trouble-Free! Gentlemen,

"I know. It's the shoe that supports the crosshead in this Ingersoll-Rand compressor. It's all one piece because this Alcoa alloy is strong, needs no hard backing."

"Sure, that's how Alcoa makes bearings. Nothing to come apart. No hard backing to damage other parts in the unlikely event of bearing failure."

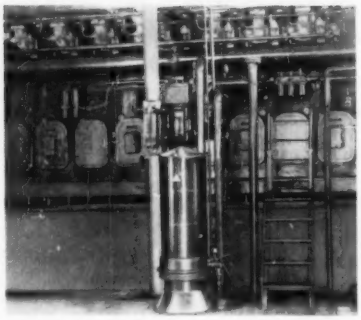
news of our industry

Action on Pipe Line Problems

Now organized is a Pipe Line Committee of the Instrument Society of America. Major objective of this committee is to secure continuing cooperation between pipe line companies and control equipment manufacturers. Through their efforts they hope to contribute effective solutions to instrument and control problems facing the petroleum and gas pipe line industries.

New Financing Plan Concluded by Mack

To take care of expanding sales volume, Mack Trucks, Inc. has concluded new financing arrangements. The agreement, made with 53 banks headed by Bankers Trust Co., makes an extra $56,422,500 available to Mack over the previous agreement negotiated. The new plan provides for initial commitments of $136,422,500. There is also an open-end provision for additional borrowings as required.



Sewage Plant Cuts Costs With CJC Filters

Installation of four Norse Electric CJC filters in Hunts Point, N. Y. Pollution Control Plant, it's reported, has meant savings of $735 per engine per year in terms of cleaning and filter replacement costs. Also reported are a 500% increase in continuous filtration time and lube oil savings of 100 gal a month.

The filters are installed on the plant's 2 generator-blower combinations and 2 blowers driven by Cooper-Bessemer 900-hp gas diesels.

All GM Diesels At Inland Petroleum

Inland Petroleum Transportation Co., Seattle, now owns a fleet of 32 full trucks and trailers and 11 semi-trailers. Carl R. Seaberg, maintenance superintendent reports all are powered with GM diesels—some with the new 6-71 E engine.

API Conference Covers Broad Scope

A streamlined program was presented at the 37th Annual Meeting of The American Petroleum Institute on November 11-14 in Chicago. About 7000 oil men and guests registered.

Group sessions were held on every phase of the industry from Finance to Public Relations. Top leaders reported on vital topics which varied from "Upgrading Personnel to Keep Pace With Mechanization" to "1958 Forecast of Petroleum Demand".

Hon. Bertram D. Tallamy, Federal Highway Administrator, was one of the speakers at the Transportation session.

You Can't Beat This Alcoa Alloy Bearing!

"Very unlikely! Alcoa bearing alloy embeds well, resists scuffing and overheating. Also it's highly conductive, in many machines runs 20° cooler than other bearings."

"Alcoa bearing alloy is so good it's used for this compressor's main and crankpin bearings, too. And although bearing loads on compressors are well under 1000 psi, Alcoa alloy can take up to 10,000 psi where required."

"No other bearing metal has aluminum's unmatched combination of advantages. Get more information. Write: ALUMINUM COMPANY OF AMERICA, 1988-M Alcoa Bldg., Pittsburgh 19, Pa."

news of our industry

Deltic-Powered Locomotive Ends Successful Probation

Plus performance is now a matter of record for the Napier Deltic-powered high-speed lightweight diesel-electric locomotive, also called the "Deltic". It has logged some 86,000 miles—most of it in passenger service on the Liverpool/London nonstop run for the British Railways. Now, since June 4, it's on a continuous 17-hr, 720 mile-a-day schedule.

The "Deltic" is powered by two 1650-bhp Napier Deltic 18-cyl diesels, each of which drives a 1100-kw main generator and a 45-kw auxiliary generator. Current from the two main generators is fed to six driving motors. The locomotive has a rating of 3300 bhp, a maximum tractive effort of 60,000 lb, and a continuous tractive effort of 29,000 lb at 35 mph. Its top speed is 105 mph.

Weighing 106 ton, the "Deltic" has maximum axle load of 18 ton. It has 800-gal fuel capacity and can carry 600 gal of water for train heating.

Cross-Country Luxury Bus

Mack Trucks, Inc. has invaded the inter-city bus market with a luxury model. Powered by Mack's turbocharged Thermodyne diesel, this long-distance bus has a specially designed 4-speed transmission and power steering.

The bus will accommodate 41 passengers, who will find airglide suspension, air conditioning, foam rubber reclining seats and other features for their comfort.

Latest F-M Sales

Fairbanks, Morse & Co. has just reported the sale of 13 units. These orders include, among others, a 12-cyl, 1920 hp Model 38DD8⅛ dual-fuel diesel sold to Kettle River REA, Minnesota. Another of these units will go to the City of Mulvane, Kansas.

P. S. Pell & Co., Ltd., Honolulu, ordered a 45B3⅛, 5¼ hp dc diesel generating set. Banco Nacional de Credito Agricola, S. A., Sonora, Mexico, purchased a 5-cyl, 375 hp Model 38F5¼ engine.

BIG EMD Diesel Order

Electro-Motive Division, GM, has an order for 28 diesel locomotives from Duluth, Missable & Iron Range Railway. This $6,750,000 purchase will bring the road's total to 81 units. They expect to buy 36 more in the next two years resulting in complete dieselization of the railroad.

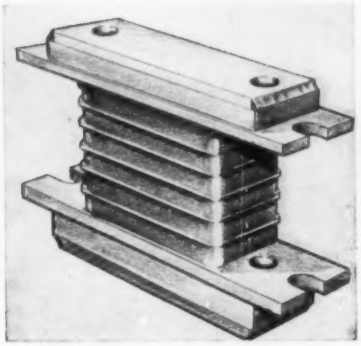
Rockwell Buys German Plant

Ilo-Werke, G.m.b.H., a leading West German maker of 2-cycle, air-cooled diesel and gasoline engines, has been acquired by Rockwell Manufacturing Company. This is Rockwell's first wholly-owned manufacturing subsidiary in Europe. The purchase represents an initial investment of over $2 million in cash.

Two plants, one in Pinneburg and the other in Munich, provide a total of 215,000 sq ft and are manned by 1200 employees. Ilo-Werke management, headed by Heinrich Christiansen as president, will remain the same.

(*Continued on Page* 66)

new products



Shock-Resistant Traction Motor Mounting

A new nose support mounting for use on standard railroad traction motors has been developed by Lord Manufacturing Company.

The mounting is made of specially compounded environmental resistant elastomer bonded to steel plates. One-piece construction eliminates assembly and parts replacement.

An important advantage claimed for the new mounting is that it will not "bottom out" under high shock loads. Pre-load holds the mountings snugly between truck frame lugs under motor weight.

These bonded rubber mountings are interchangeable with present suspension systems.

Hand Gun for Cleaning Heavy-Duty Air Filters

Fleets, garages and repair shops will want to know about the new hand air filter cartridge gun designed by Fram Corporation.

Attached to regular air line hose, it has a push button control for easy operation. A series of holes in the metal nozzle allow a metered air flow to clean the cartridge from top to bottom. This Fram hand air gun is ruggedly built of brass and cadmium plated steel.

Rough Rover

They're really getting diesels down into small sized vehicles. This rugged jeep-size 4-wheel drive Land-Rover, introduced by Rover Company, Ltd., takes to tough terrain with its 4-cyl diesel power. It produces 52 bhp at 3500 rpm.

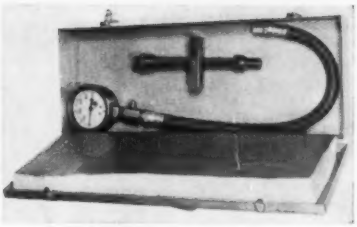
Features incorporated include CAV-built version of the Roosa-Master fuel injection pumps, wet cylinder liners, 3-bearing counterbalanced crankshaft and camshaft with special cams for high valve lift with minimum stress on the valve operating gear. The efficient Ricardo Comet V combustion chamber insures high air utilization.

Land-Rovers, now on the market in England, are expected to be available in this country soon.

For Storage of Fuel Drums

New steel rack by Pressed Steel Division, Republic Steel, allows stacking of loaded barrels and drums without special equipment. Any standard fork lift truck can handle as many tiers of drums as its lifting capacity allows. A 2-drum lift can be made from front, back or side.

Design of the rack isolates each drum from the other. Made of heavy gauge channel steel, the rack is strongly braced and welded and enamelled to resist rusting. One unit will support 7500 lb in 18-gauge drums and 14,000 lb in 16-gauge drums.

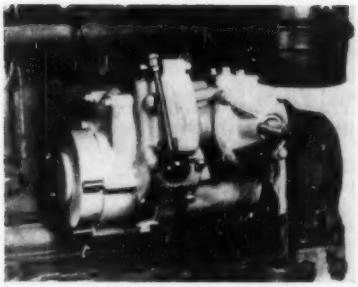


Cylinder Compression Gauge

For diagnosing diesel troubles, Kent-Moore Organization introduces a cylinder compression gauge. Checks are simple and fast with this new gauge.

Adapter supplied with the Kent gauge is installed in place of the injector nozzle and the engine is operated on the other cylinder. The precision gauge registers pressure from 0 to 1000 psi in the non-firing cylinder. The needle records maximum indicated pressure until released by thumb vent valve.

The unit is packaged in a metal case with plastic sponge lining for protection. Adapters are available for all popular model diesels.



Inertia Starter for Diesels

"Instarta" is the name of an inertia-type starter developed in Great Britain. Its torque output is indicated as being suitable for starting diesels in the horsepower used in farm tractors, irrigation pumping engines, fork lift and other engines.

Principal advantage of this type starter is that as long as you have any muscle left (and it doesn't take much), you can turn the engine over. No other source of energy is needed. Absence of electrical items makes this type of unit well suited for engine operation in potential fire-or explosion-hazardous areas.

Principle of operation is to store hand-cranking energy, a little applied over a relatively long time, in a rotating inertia mass. This energy is then applied to the engine's flywheel at a rate sufficient to turn the engine at cranking speeds.

Main design advantage is the ingenious method of applying the inertia torque to the flywheel with a minimum of energy loss. A variable transmission provides a progressive change in gear ratio of the drive The highest torque multiplication occurs at the start and then gradually decreases as the gear ratio is decreased. This gradual application of torque avoids high shock loads on the starting mechanism and permits more efficient utilization (up to 97% is stated) of the inertia mass energy.

Production models are suited for diesels up to 1.2 liters (about 73 cu in.) per cylinder capacity. They can replace a standard electrical starting motor. They are available in Great Britain. Also the builders, holding broad international patent rights, are open to negotiation for licenses to manufacture and market these starters in this country.

NAPIER PACKS CRACK LINER SPEEDS INTO 70 FT. CREW BOATS!

Employees of the Compañía Shell de Venezuela are now transported to offshore drilling platforms in Napier Deltic powered crew boats that move *faster than crack Atlantic liners*. This is a big advance on existing slow surface transportation or helicopters with small payload and high operating and maintenance cost.
Power for the boats comes from two 9-cylinder opposed piston diesels. These Deltics with their "triangle" of cylinders ensure an amazing balance and freedom from vibration even with 1,620 h.p. in the engine room.
Fast, reliable, all-weather movement of men and materials has become a must for all offshore oil operations if they are to run on an economic round-the-clock basis. Napier Deltics provide twin-engined reliability and drive the fully-loaded, 50-passenger Shell Boats at an easy and safe 35 m.p.h. under continuous cruise conditions.
Plans of Napier Deltic powered crew boats specially designed for Gulf operation are available. For more information on the Deltic diesel contact the Napier Representative—L. O. Brooks, 909 Dupont Circle Building, Washington 6, D.C. Phone North 7-0146.

3 visible reasons why Napiers were chosen

1 INCREASED PAYLOAD. The most powerful engine for its size and weight in the world, the Deltic takes up less space than engines of comparable horse power. In this case room was made for seating 50 passengers.

2 EASE OF MAINTENANCE. The Deltic is a self-contained packaged unit and all filters are built in. Parts are easily interchanged and can be replaced simply by removing nuts. Pumps can be replaced without timing pumps to engine.

3 ALL WEATHER PERFORMANCE. In rough weather Shell Boats get the best of both worlds. Unlike helicopters, they can still operate and still maintain their relative speed advantage over existing surface transportation.

NAPIER DELTIC MARINE DIESEL

A new conception of Marine Power

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Partners in Progress with The ENGLISH ELECTRIC Company Ltd.

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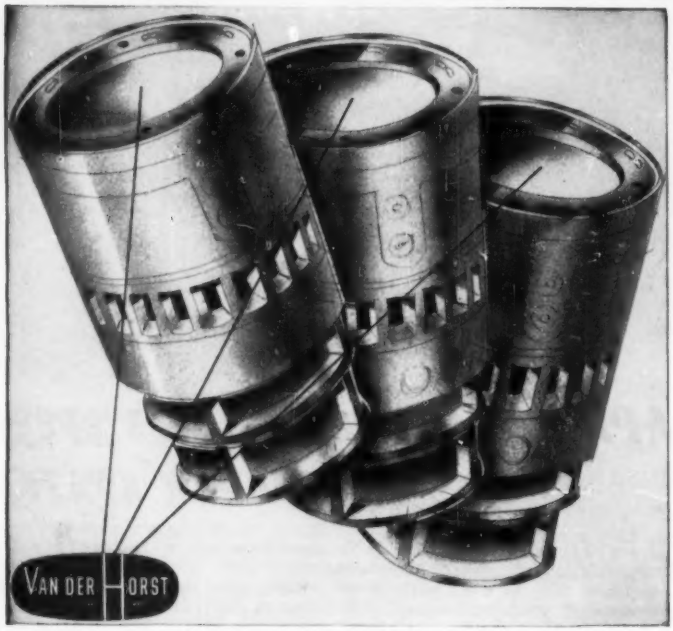

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PORUS - KROME DEFINITELY CONTRIBUTES TO A REDUCTION IN LUBE OIL CONSUMPTION.

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new products

Fuel Filter Element Increases Filtration Area

News comes from ALCO Products, Inc. of a secondary fuel filter element for use on high-power diesels. Filtration area in the new pleated element is 13% greater than the previous ALCO standard unit.

Laboratory tests rated the selected element highest in volume of total solids removed and ability to retain its shape under pressures encountered. It also showed lower pressure drops than any other designs investigated.

Diesel Fuel Filter Added to Dispensing Pumps

A new fuel filter has been added to all Fleetmaster diesel fuel dispensing pumps made by Bennett Pump Division, John Wood Company.

Filter elements have initial rating of 25 to 40 microns providing maximum filtration of fuel as it is dispensed. Attached to the hose outlet elbow, filters are exterior mounted for easier access.

The filters are incorporated on all new Fleetmaster pumps and are also available as a kit for installation on existing pumps.

Longer Life For Cat Crawler Sprockets

Sprocket life will be longer, Caterpillar promises, now that sprocket castings are being poured from boron steel. Minute amounts of boron are added to steel to improve evenness and depth of hardness resulting from heat treatment. Boron additives, they state, have virtually no effect on other properties of steel.

Marketed under the name Boralloy, these sprockets are now standard equipment on Cat D8 and D9 tractors. Boralloy replacement rims are available for D8 sprockets.

The new boron steel sprocket was developed jointly by Caterpillar Tractor Co. and Harrison Steel Castings Co. Their research project is said to represent the first commercially successful attempt to produce boron-bearing carbon steel by acid open-hearth process, it is reported by metallurgists of the two companies.

new products

One-Coat Solid Film Lubricant

A long series of tests have been completed by Electrofilm, Inc. on its latest corrosion-resistant solid film lubricant. These tests show the new formula 66-C meets the requirements of Mil Spec (L-25504) without sacrificing long wear or frictional properties.

Coefficient of friction is less than 0.04 and the lubricant withstands 1300-hr salt spray test over anodized aluminum. Electrofilm recommends the coating in temperatures ranging from —65°F to 600°F and for high loads and high speeds.

Bucket Positioners Added to Cat Tractors

Automatic bucket positioners for No. 955 and No. 933 Traxcavators have been announced by Caterpillar Tractor Co. The positioning feature, long standard on No. 977 Traxcavator, automatically moves the bucket tilt control lever from tilt-back to hold position when the bucket reaches a pre-set digging angle.

Adjustable linkage on the bucket positioner allows the bucket to be placed at any point between an approximate 5-deg digging angle and a 3-deg tilt-back angle.

Field change-over kits are available for No. 955 and No. 933 Traxcavators already in operation.

Thermostatic 3-Way Valve

Lawler Automatic Controls, Inc. has introduced a new thermostatic 3-way valve. It is unaffected by high pressure differentials in operation. It features a pressure balanced type of seat construction which provides positive closing of both seats regardless of high water pressures acting against them.

Of piston type, the valve automatically regulates water flowing through it, thermostatically. On increase in temperature, the piston opens the cold water port and closes the hot water port to bring the delivered water down to the desired temperature.

Two-inch and larger sizes are now available with smaller models scheduled for the near future.

THIS PARK DIE-FORGED CRANKSHAFT WEIGHS 3500 POUNDS

. . . is typical of 25 models from 1500 to 5000 pounds, made for diesel and gas engines

This "six throw" crankshaft, almost 12 ft. long, is representative of the large die-forgings Park supplies to manufacturers of gas and diesel engines.

Park's facilities include a complete die-sinking shop, modern specialized heat-treating equipment and experienced metallurgical and engineering staffs.

Our sales engineers will show you how Park die-forgings can increase strength and safety—cut down size and machine time on your requirements.

Die Forging Specialists Since 1907

THE PARK DROP FORGE CO.

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Carbon, Alloy, Heat-Resistant Alloy, and Stainless Steel Closed-Die Forgings from 4 lbs. to 5000 lbs.

new literature

"Jimmy" Truck Diesels

Four diesel engines for trucks of 26,000 lb gross vehicle weight and up are described in a new 6-page piece just released by Detroit Diesel Engine Division, GM. Covered are the Division's 71-E and Turbopower engines designed to provide low-cost mileage for all types of highway hauling units.

New A-C Drive for Lift Trucks

Details on the power shift torque converter drive for fork lift trucks are given in a booklet by Buda Division, Allis-Chalmers. Illustrations help tell about the operating advantages of the new drive. Cutaway views of drive and torque converter, which A-C has pioneered in lift trucks, describe operation of each unit.

ROCKFORD

LONG LIFE
Heavy-Duty
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TAKE-
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ELIMINATES
PILOT
BEARING

Eighty five percent of all take-off failures that are caused by misalignment, lack of lubrication, overload and other reasons—stem from the pilot bearing. By eliminating the pilot bearing—in this new Oil Field type, long-life, extra heavy-duty power take-off—ROCKFORD has reduced down-time to a minimum. This improvement will help increase the trouble-free work-hours of your equipment.

SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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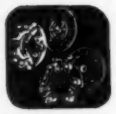
Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

CLUTCHES

Battery Bible

From theory to maintenance is covered in the "Battery Users Manual" published by Gould-National Batteries, Inc.

Aimed primarily at industrial truck batteries, it has application to all heavy-duty batteries. Developed as a result of in-plant training courses, the 44-page book will help any plant engineer, superintendent or foreman conduct an organized battery training course in his own plant.

Your copy of this publication No. GB-1599A may be requisitioned on the reply card attached in the last section of DIESEL POWER.

Semi-Floating Shaft Couplings

Thomas Flexible Coupling Company has prepared a brochure describing applications for their semi-floating shaft couplings. These couplings are used where units are spaced apart and only one bearing is provided for one of the units, such as engine-driven generators.

Parallel misalignment is eliminated and only angular misalignment needs to be taken care of. This results in an economical layout and a saving in space. Radial loads can be supported without pilot bearings.

Among advantages listed by Thomas for these flexible couplings are no maintenance or lubrication requirement, no backlash, no wearing parts and long life.

AED Issues Rental Directory

Useful to construction machinery users everywhere is the new Ninth Edition "Compilation of Rental Rates for Construction Equipment."

The 1957 "Green Book," as it is popularly known, is published by Associated Equipment Distributors. It contains over 80 pages of national average rental rates for some 2000 construction units and illustrates many of the major types of equipment.

Rental rates quoted were established by an AED survey completed in June among the Association's 700 distributor members.

This book, at $5.00 a copy, can be ordered direct from Associated Equipment Distributors, 30 East Cedar St., Chicago 11, Ill.

new literature

Mobile Hydraulic Excavator

Hyster Company covers design features and performance of its new D4 hydraulic backhoe in a 3-color, 16-page presentation.

Engineered as an integrated unit for Cat Models D4 tractor, 955 and HT4 Traxcavator, the resulting matched equipment gives mobility and versatility to meet wide job demands. It handles any utility digging job down to 13 ft below grade.

Inside Story on IH Power Units

International Harvester Co., covers its line of six diesel power units in a new 12-page catalog.

Diagrams, cross sections, exploded views and photo close-ups give the inside story of the UD-281, UD-350, UD-14A, UD-525, UD-18A and the UD-1091.

Features illustrated include the full-flow, by-pass cooling systems of the UD-1091, the new open-face, single-orifice injection nozzle in all these diesel units, and the Lanchester engine balancer which provides smooth operation in the 4-cyl engines.

One page is devoted to dimensions and horsepower ratings of the units including the recently-introduced 250-hp Turbotorque UDT-1091.

All About Power Transmission

Ohio Gear Company's 1957 handbook is packed with power transmission data. Its 186 pages include a wealth of material useful in designing proper transmission for any drive. Charts, tables and formulae point the way to selection of gears and speed reducers for a specific job.

The gear section tabulates complete dimensions on Ohio standard spur, level, spiral, helical, worm gears and steel rack. Section on speed reducers gives the designer specifications and mechanical information necessary to select proper reducer in relation to required ratios, horsepower, torque and installation dimensions.

Any engineer will find this book a good one to refer to for valuable transmission ideas.

Self-Locking Threaded Parts

Nylock-Detroit Corp. has issued a leaflet telling about the self-locking, sealing and adjusting principle of its threaded parts.

The piece also explains how the locking medium—a protruding nylon pellet permanently inserted in the threaded section—can be applied to any threaded part regardless of size, shape or function.

Also included are basic engineering recommendations, plus a check list for the design of threaded parts which will benefit by this process.

Variable Speed Vee-Belts

Dayton Rubber Company Industrial Division has prepared a reference handbook on variable speed vee-belts for every type and make of unit. Information is cross-referenced and contains complete interchange listings including drive data and parts numbers of manufacturers.

For your copy of any of this data, use the postage-free card in the last section of this publication.

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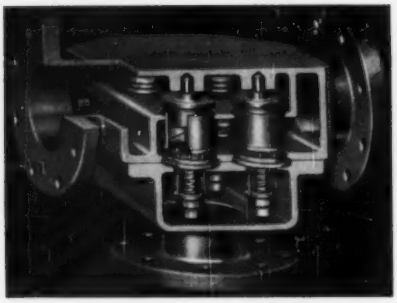

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JACKET WATER & LUBE OIL THERMOSTATS

SAFETY	Provided for by multiple independent elements as shown above.
√	Provided for by rugged AMOT element construction. No AMOT element has ever stuck closed since its introduction 6 years ago. Many years of "know how" are built into every AMOT element.
√	Omission of all hand operators means engine temperature is safe from tampering by engine attendants. AMOT is the only engine thermostat that can be considered safe without a hand operator.
√	Lack of capillary tubes, bulbs, and packing glands means no failures from kinks or leaks.
SERVICE	There is only one replaceable part—the element. Renewal of element renews all working parts. Element replacement, if ever required, is several times faster than on any competitive make. Original accuracy of temperature setting is always provided in element replacement.
√	AMOT engineers are available in most major cities to help on application and other problems.
√	Most models are available from stock for rush orders.
MODELS	½" to 6" pipe sizes. Larger sizes in iron, bronze or ductile iron.

AMOT CONTROLS CORPORATION • FIRST ST. & NEVIN AVE. RICHMOND, CALIFORNIA

BRIGGS OFFERS YOU, FREE, A 16 PAGE MANUAL ON OIL FILTERS AND METHODS OF INSTALLATION

HERE is a big 8½" x 11", file size, 16 page, fully illustrated booklet. It's brimful of technical data and drawings that every designer and operating engineer will want to read or keep for ready reference. Write for your copy. No obligation.

Briggs OIL FILTERS

FILTER/SEPARATORS

YES! THE BRIGGS FILTRATION CO., DEPT. 227, WASH. 16, D.C.
AT NO COST or obligation, send me the above booklet

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new literature

Facts About Friction

Caterpillar Tractor Co. answers questions about friction material in clutch facings and brake linings in "Friction Facts". Loss of friction, glazing, chipping, wear and torque capacity are discussed. Tests are outlined which Cat friction materials must pass before approval for use in new tractors or replacement parts.

Another piece, "The Big Three", gives benefits from using Cat grease seals—special facing material, proper contact pressure and heavy-duty diaphragms. This latter Cat booklet is obtainable in French, Spanish, and Portuguese, as well as in English editions.

ALCO Locomotive Line

A 24-page brochure by ALCO Products, Inc. reviews its various diesel-electric locomotives from the 900-hp all-purpose unit to the 2400-hp locomotive for heavy freight. A section deals with the DL-500 world locomotive now being exported to India, Pakistan and other countries.

Also pictured is the powerful 12-cyl vee-type, 1800-hp Model 251 ALCO diesel which powers the export locomotive. This engine is also available in 6- and 16-cyl versions.

New features incorporated in both engines and locomotives are described.

Two Highway Reports By ARBA

American Road Builders' Association reviews and evaluates credit problems of the highway industry in a 20-page report. It is a comprehensive national study of the credit problems present in the authorized 13-year, $25 billion federal expressway program.

Another report, "The Highway Construction Industry in a Long Range National Highway Program" is offered by ARBA. This covers long-term planning, design and expediting, materials and supplies, construction, machinery and equipment.

Write direct to ARBA, World Center Building, Washington 6, D. C., for a copy of these reports. Each costs 50c to members, $1.00 to nonmembers.

new literature

For Farm Equipment Repairs

New publication by Eutectic Welding Alloys Corp. gives the before and after story of tools and equipment salvaged by "Low Heat Input" welding.

This Farm Maintenance Welding Issue treats practical repair problems, gives ideas on how to repair rather than replace worn or damaged parts. Illustrations in the 28-page booklet show scores of actual salvaged farm parts of cast and malleable iron, mild to high alloy steels and aluminum.

Reconditioning Crankshafts

National Forge & Ordnance Company tell how they recondition diesel crankshafts in an interesting brochure. Illustrations point up rigid tests and inspections made by engineers and skilled workmen.

Latest metallurgy techniques are used and all work must meet exacting standards and tolerances. Finished bearing surfaces have a minimum of 85% bluebox fit and surface roughness of not more than 10 micro inches.

"Before" and "after" inspection charts are prepared for each crankshaft so the customer has a complete reconditioning history for ready reference.

Oil Field Power Units Engineered for Long Life

"Long-Life" natural gas engines by Waukesha Motor Company are especially designed for extra long unattended service. Several built-in features and accessories are responsible for this extended service.

Ren automatic oil levelizer and large supply tank provide an accurate amount of make-up lube oil as needed. Oversize filters maintain the condition of the oil. Oversize oil-bath air cleaners and pre-cleaners requiring infrequent attention safe-guard against dust in the fuel-air mixture.

Kysor automatic radiator shutters assure accurate temperature control. All these and other features of "Long-Life" power units are described in Waukesha Bulletin 1702-B.

National Fire Codes

National Fire Protection Association has just revised its set of six books on national fire codes.

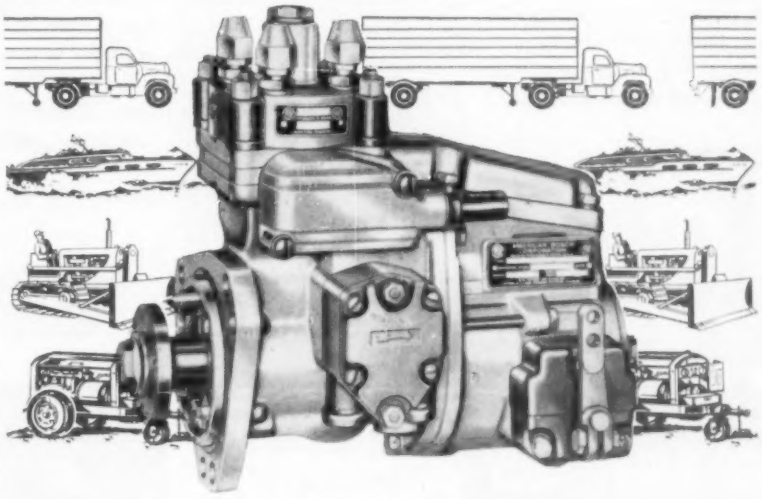
Volume VI deals with transportation equipment—bus, truck, and marine transportation and salvage. Its 672 pages give 28 fire safety standards and a comprehensive review of all applicable government regulations.

This volume can be purchased for $6.00 direct from NFPA, 60 Batterymarch St., Boston 10, Mass.

Universal Nozzle Tester

Western Industries, Inc. offers a 40-page instruction manual on a tester for all models of diesel nozzles and injectors. This is the same unit originated by Buda, now manufactured and distributed by Western. The portable tester can also be used for checking self-contained hydraulic systems.

For more details on any of these products, just fill in the postal card inserted in this publication.



Key to top performance . . . the PSB fuel injection pump

The PSB Fuel Injection Pump has established an unmatched record for dependable and economical diesel engine performance.

Proven design—here's a fuel injection pump with fewer parts and simple construction, employing positive governor control and a replaceable hydraulic head for fast field servicing.

Outstanding operating economy—from precise fuel metering and accurate distribution . . . the PSB Fuel Injection Pump's efficient design and careful manufacture assure long, trouble-free operation with minimum maintenance.

Backed by low-cost repair service—from "original-maker" repair by factory-trained experts at Authorized American Bosch Service Stations . . . nearly 200 in North America, Hawaii, and Puerto Rico . . . all equipped with special tools and test equipment, and stocked with genuine American Bosch replacement parts.

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DIVISION
AMERICAN BOSCH ARMA
CORPORATION
SPRINGFIELD 7, MASS.

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organizational news

Heads Twin Disc European Sales

Hans Taeger is now European sales manager of Twin Disc Clutch A.G. His headquarters are in Zurich, Switzerland.

Prior to this, as assistant manager of export sales, he acquired broad technical and commercial know-how of foreign requirements for Twin Disc friction clutches, fluid couplings, 3-stage and single-stage torque converters and marine gears.

Hans Taeger

D. Gallogly

R. F. Kymer

Cooper-Bessemer Promotes Two

Dennis L. Gallogly has stepped up to assistant executive engineer at the Cooper-Bessemer Corporation. He will work directly under Edmund Fredrick, executive engineer. All three engineering divisions—product, development and technical—will report to Mr. Gallogly.

Taking over his former post as chief engineer, product division, is R. F. Kymer. Previously he served as assistant engineer.

Joins Marquette

R. C. Gommel has been appointed sales and application engineer of the Marquette and Massey Divisions of Curtiss-Wright Corporation. He will make his headquarters in Cleveland.

Mr. Gommel has had 18 years experience with Marquette hydraulic isochronous governors. He formerly operated Pacific Engine Control Co., authorized Marquette-Massey representative on the West Coast.

R. C. Gommel

DIESEL ENGINES GO RIGHT NOW WITH...

KIM Hotstart electric pre-heater

Just plug KIM into the electric circuit. It draws cold water from the engine, heats it, then circulates it back through the engine. *Result*: quick starts regardless of cold weather; elimination of warm-up time; reduced engine wear and maintenance; responsive power the instant it is wanted. Thousands in use.

Write for literature.

KIM HOTSTART MANUFACTURING COMPANY

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GRIND CRANKSHAFTS IN THE BLOCK!
The Winona Lathelok Crankshaft Grinder has given fast, accurate service in the Automotive field for over 18 years. Now it's available to the Diesel field. With a new large hook, the standard grinder will now grind shafts up to 3½" in diameter in the block!
WRITE FOR DESCRIPTIVE LITERATURE AND PRICES.
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WINONA, MINN. U.S.A.

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STURTEVANT
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Read by Sight, Sound or Feel

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in inch grams
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Every manufacturer, design and production man should have this valuable data. Sent upon request.

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UNIVERSAL
INJECTOR TEST STAND—

For Testing all Unit Injectors in One Fixture. Makes Plunger and Bushing Tests on all General Motors Unit Injectors.

KIENE HYDRAULIC TEST PUMP — For making all conventional Tests on Nozzles. Photo shows use with Universal Injector Test Stand.

KIENE CONNECTOR NUTS — For convenient Attachment of Equipment to Test Stand or Test Pump. All sizes Connectors available.

KIENE PORTABLE
TEST EQUIPMENT

An entirely new and different product for the Diesel Industry offering features never before available in the field of Injection and Hydraulic repair and Servicing tools. Kiene Injector Test Stand and Hydraulic Pump give you all operating advantages of existing tools in addition to introducing many new and exclusive features. Kiene Products are Portable, Light Weight, Compact, Rugged and Revolutionary in Design. They are engineered to give the Field Service Man adequate tools for on the job diagnosis and quick repair of valuable Diesel Equipment.

SAVE MONEY—
SAVE DOWN TIME

Write for Bulletins KTP-50 and UTS-10

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

News from Mack Trucks

Walter M. May, vice president-engineering, Mack Trucks, Inc., has announced two appointments and two promotions in the engineering division.

Allen H. Glasenapp, previously with International Harvester, has joined the Mack organization as executive assistant to Mr. May.

Irvin G. Detra, formerly with New Process Gear Corporation, is now executive engineer in charge of gear design.

Winton J. Pelizzoni is promoted to assistant executive engineer to Bruno Loeffler, executive engineer in charge of engine design. Mr. Pelizzoni had been manager of Mack's testing laboratory.

Named executive engineer of bus design in the Sidney, Ohio plant is Donald L. Manning. He served as general engineer of C. D. Beck & Co. acquired by Mack last year.

Four Cummins Promotions

C. R. Boll, vice president of sales, announces the advancement of four men to new positions in Cummins Engine Company, Inc.

T. J. Paxton is promoted to western distribution manager. He will make his headquarters at the Columbus, Ind. plant.

T. J. Paxton

R. F. Davis

B. K. Jacob

J. E. Grimmer

R. F. Davis is named manager of fleet sales. He will be responsible for all fleet accounts in eastern United States and will operate from the New York City office of Cummins.

Taking over as regional manager, eastern district is B. K. Jacob. His headquarters are also New York City.

J. E. Grimmer is the new Rocky Mountain regional manager with offices in Denver.

AAF Increases Foreign Outlets

Burt Lawson, foreign department manager of American Air Filter Company, Inc. reports the addition of two new sales centers in the growing South and Central American markets.

Servicio Technico Panamericano, Caracas, Venezuela, will represent engine and compressor, air-filter, dust control and other AAF departments.

An agreement was also signed with APO Manufacturer's Representative to represent AAF in Santurce, Puerto Rico.

This brings the AAF total to representation in 35 overseas markets.

FOR MAINTENANCE FREE POWER TRANSMISSION

Specify

THOMAS

FLEXIBLE COUPLINGS

DOUBLE FLEXING
DBZ — for high speed, heavy duty drives

FLOATING SHAFT
BMR — for heavy duty service with excessive misalignment

DOUBLE FLEXING
AMR — for engine and medium speed drives

SINGLE FLEXING
SS — for engine-driven generator sets with out-board bearings

Thomas' 40 years of flexible coupling experience is at your disposal to help you meet ordinary applications or special variations for unusual cases.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51-A

THOMAS FLEXIBLE COUPLING CO.

WARREN, PENNSYLVANIA, U. S. A.

organizational news

Clessie Cummins

Cummins Founder Retires

Clessie L. Cummins, founder of Cummins Engine Company, Inc., has retired as honorary chairman of the board.

He started the firm back in 1919 and served as its president until 1947. Since then he was board chairman until 1951 when he assumed the honorary chairmanship. During the war years he was director of diesel production, War Production Board.

Mr. Cummins built his first diesel under license 38 years ago. It was a 1-cyl, 6-hp unit. Next he produced two horizontal farm engines.

Among the "firsts" scored by this veteran inventor was a Packard powered by a 4-cyl diesel which he drove from Indianapolis to the 1930 N. Y. Auto Show. For this trip he shelled out $1.38 for fuel and averaged 35 mpg.

In 1931 he developed the first diesel race car to run in the "Indianapolis 500". A year later he made the first installation in a truck of the Cummins Model H diesel equipped with a patented fuel system.

Seven New Mack Distributors

Continuing with its sales and service expansion, Mack Trucks, Inc., has added distributors in six states, it's announced by Lewis E. Minkel, general sales manager.

Two distributors have been named in Kansas—Gray's Auto Service, in Liberal, and Mack Truck Sales, Wichita. Shipley Motor Equipment Co. will represent Mack in Fort Smith, Ark.; Lamar Davis Motor Co. in Albany, Ga.; Forde Johnson Truck Service, Inc., Idaho Falls, Idaho; Stockton Diesel Service, Stockton, Calif., and Bell Mack Sales, Inc., Kalamazoo, Mich.

Fairbanks, Morse Assignment

James G. Graham has taken the post of Los Angeles manager for Fairbanks, Morse & Co. He replaces Paul A. Suess who will start the new year by retiring.

Mr. Graham first joined F-M in 1946. For the past two years he was general manager of the Railroad Division.

Representing Briggs Filtration

Briggs Filtration Company has appointed Creole Engineering Company as representatives for industrial sales in Louisiana and Mississippi. This firm, located in New Orleans, is headed by Ben Louviere.

A registered professional engineer, Mr. Louviere has a 10-year background in the sales and application of filtration equipment.

New Roper Firm Formed

Roper Hydraulics, Inc. is the corporation now operating the former Pump Division of George D. Roper Corporation. The new firm will utilize all the facilities of its predecessor. The same personnel will continue their research and development program.

Officers elected are John H. Makemson, president; Fred Dickerson, vice president; J. M. Hoskinson, sales manager, and John Albright, chief engineer.

J. Hoskinson J. Makemson

DISTRIBUTORS FOR FUEL OIL ADDITIVES

To represent sole U. S. agent for line of highly effective fuel oil additives with documented record of increased operating economy and maintenance efficiency in wide range of applications, including industrial, transportation and institutional. Unusual growth potential in hands of right man. Exclusive franchise in each territory; no franchise fee. You invest only in inventory. References required. Box D-1257, Diesel Power, 80 Lincoln Ave., Stamford, Conn.

organizational news

Geo. W. Edick

Cooper-Bessemer Sales Staff

George W. Edick has been promoted to sales manager, Domestic Division of Cooper-Bessemer Corporation.

In making the announcement, Grant C. Woodward, general sales manager, said he will head all branch office operations, including sales of engine and compressor equipment, warehousing and servicing.

Another change at Cooper-Bessemer, is the transfer of Walter H. Kramer to the Chicago office. He will work with D. R. Bohannan, manager of that branch.

Dresser Buys Gardner-Denver

Gardner-Denver Company has been acquired by Dresser Industries, Inc. The new subsidiary is known as Gardner-Dresser Company. Gifford V. Leece is the chief executive officer. The combined companies have a sales volume of about $350 million a year.

Waukesha Engineering Changes

The new chief engineer at Waukesha Motor Company is J. R. Merriam. He assumes the duties of Lloyd Bower, now retired. Mr. Merriam first started with Waukesha over 35 years ago as tool designer.

Another engineering change is the promotion of A. W. Pope to chief research engineer. He has worked for this company for 30 years.

H. M. Wiles and E. R. Rutenber, both with Waukesha for about 30 years, have been named assistant chief engineers. Mr. Wiles will direct experimental laboratories and Mr. Rutenber will concentrate on installations applications.

J. P. Kelly takes over as chief design engineer and will direct the expanding engine development program. A comparative newcomer, Mr. Kelly joined Waukesha 11 years ago.

Jim Miller, Shepherd Machinery Co.'s General Service Manager, administrates one of the country's largest and most modern heavy equipment repair facilities.

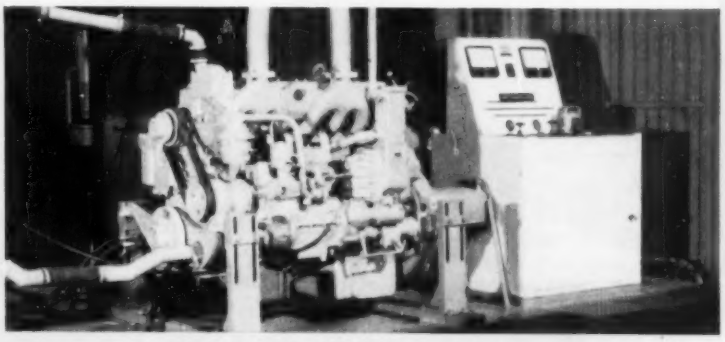
SHEPHERD MACHINERY SAYS:
"With our Clayton Dynamometer we deliver better engine performance... happier customer service— at greater profit!"

Keeping customers happy and coming back to the same place to do business is essential to Jim Miller, General Service Manager of the Shepherd Machinery Company, located in Los Angeles . . . one of the nation's largest dealers in construction machinery, industrial and marine engines.

"With our Clayton Engine Dynamometer—which we purchased in June 1953—we are certain that we're making available to our customers the highest possible standards of service, and at a profit to us.

"A Dynamometer offers many advantages," states Jim Miller, "but most important to us has been the ability to run-in and accurately test all rebuilt engines . . . This has practically eliminated costly warranty field service trips and, of course, vastly improved customer confidence in our workmanship . . . This alone means thousands of dollars a year to any engine distributor."

Let a Clayton representative show you how a Clayton Dynamometer will pay for itself out of savings alone.



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- Designed and built for "running-in" rebuilt gasoline and diesel engines.
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- Torque loads are maintained indefinitely or changed at will to fully test any engine.
- Engine adjustments on the stand are simple to make.
- All models handle either right or left hand rotation.

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OUR BUSINESS IS_____ We handle_____ engine repair jobs a week.

Send to: Clayton MANUFACTURING COMPANY
423 NORTH TEMPLE CITY BLVD., EL MONTE, CALIFORNIA

news of our industry

(*Continued from Page* 53)

South African Railways Going Diesel

An initial order adding up to $7½ million was placed with General Electric by South African Railways. All 45 Model U12B mainline diesel-electrics will haul passengers and coal in the mountainous Transvaal district. Each unit develops 1320 hp and weighs 72 ton.

International Congress Termed a Success

The fourth International Congress of Combustion Engines was a success. Held at Zurich, the level of papers presented was high. Attendance at technical sessions totaled 700 members.

Tentative plans for the next Congress in 1959 include official representation of the United States. Previously this country participated only through foreign branches of American firms such as Van der Horst Corp. and Mobil Overseas Oil Co.

More than one hundred Quincy Authorized Service Depots throughout the country carry adequate stocks of genuine factory parts for all models of Quincy Compressors. So wherever you are, you know you can put extra confidence in your Quincy Compressors.

They're built to give you the kind of service needed for jobs like diesel starting, operating air tools and controls — designed to stand up under rugged field conditions. Depend on Quincy Compressors and Quincy service for all your needs from 1 to 90 CFM. Write Dept. J-58 for catalog today.

Quincy COMPRESSORS
FOR LOW COST AIR POWER
QUINCY COMPRESSOR CO., QUINCY, ILLINOIS

AED To Meet

January 26-30 is the date set for the 39th Annual Meeting of Associated Equipment Distributors. The place is the Conrad Hilton Hotel in Chicago.

Generators on Way To Missile Launching Site

American MARC, Inc. has begun deliveries of 454 static exciter 45 kw 400-cycle generators to the U. S. Army Corps of Engineers. They will power electronics equipment at missile launching sites and other ground operations.

They represent the first production of the Electro-Dynamics Division and are part of a $809,000 contract with a prime contractor. The order, to be completed by April 1958, also calls for 117 conventional 20 kw generators for the U. S. Marine Corps.

Atmospheric Engine Now In National Museum

One of the world's oldest atmospheric gas engines built by its inventor, Nikolaus August Otto, has been permanently retired in the Smithsonian Hall of Power Machinery. It was donated by the company the inventor founded at Deutz-Cologne, Germany, now known as Kloeckner-Humboldt-Deutz A.G.

The antique engine, in complete working condition, is ½ hp at 80 rpm and has a gas consumption of 26.5 cu ft per hp-hour. In 1867 it received the gold medal at the World Exhibit in Paris.

Metallurgists Honor Erie Forge Director

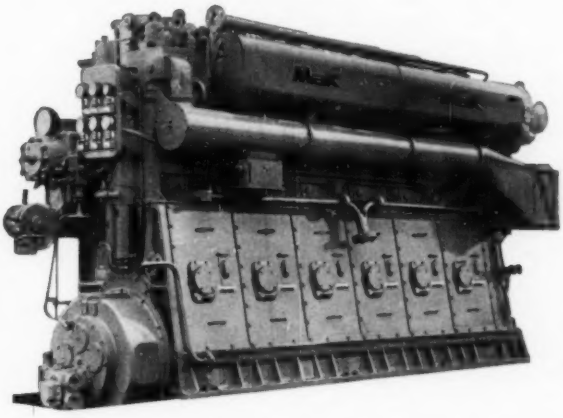
J. J. White, director of metallurgy and research, Erie Forge & Steel Corporation, was recently feted for his contributions to the steelmaking and forging industry. Members of the Forging Manufacturers Association paid tribute to his accomplishments at a dinner in his honor.

Mr. White's activities during the war years were concentrated on developing steels for Federal Ordnance groups. His efforts now are directed toward a 2-year program for doubling Erie Forge tonnage capacity and broadening its products including electric furnace steels.

WITH SHIPS STEADILY GROWING BIGGER MORE POWERFUL TUGBOATS ARE NEEDED

So MaK engines of the M582 Series are used more and more for propulsion of tugs.

Here is a typical case. On one of the most heavily-used navigable waterways, the North Sea—Baltic Sea canal, the towing and rescue boat STRANDE was recently placed in service. Carrying the highest Finnish classification as an icebreaker, it keeps the canal obstruction-free in winter, thus handling ships' traffic the year round without interruption.



In many other harbors of the world, tugboats, rescue boats and icebreakers are powered with the sturdy M582 Series engines. These, being reinforced in all main parts, have proven their reliability in heavy-duty service and in vital operations.

Here is some data on the M582 Series engines of special interest to you.

Horsepower Range: 750 to 1920 HP
Speed Range: Up to 500 RPM
Bore: 15.16 IN; Stroke: 22.83 IN
Nominal Piston Speed: 1142 FPM
Four-Stroke Cycle—Direct Fuel Injection—Individual Injection Pumps—Sturdy Tie-Rod Construction—Column-Type Structure

Customer service and licensed shop facilities are available in many big sea and inland harbors.

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Affording Maintenance At Less Cost
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Low Valve: 60, 70, 80, & 90 mm
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news of our industry

Transport Fleet Adds Twenty Diesel Tractors

ET&WNC Transportation Co. of Johnson City, Tenn. continues to modernize its fleet with the purchase of 20 more White 9000 tractors powered by Cummins JT-6-B engines. The fleet is now 25% dieselized.

This company is switching to diesels, it states, because of greater fuel mileage with diesel-operated units, ability of diesels to "take hills faster" and the greater service period between engine overhauls.

City of Houma Orders Nordbergs

Nordberg Manufacturing Co., through its New Orleans office in the International Trade Mart, has received an order from the City of Houma for almost $2 million of power equipment. About 25 railroad cars will be needed to transport the three 2-cycle dual-fuel 3750 kw generating units, complete with Elliott generators.

When shipment is completed in January, 1959, Houma will have the largest municipal diesel power plant in Louisiana. Its capacity, now at 7500 kw, will then total 18,750 kw.

Weight Down, Payload Up On PIE Trailers

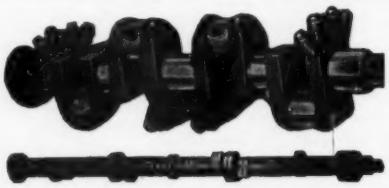
Pacific Intermountain Express has trimmed 2000 lb from the 100 new aluminum vans delivered to Brown Trailers, Inc. The payload is up by nearly a ton over conventional aluminum trailers.

The new 40-ft units weigh in at 7680 lb each—complete with tires, spare wheel and company signs. Reduced poundage results from advanced running gear which saves over 400 lb, lightweight aluminum flooring, aluminum slat lining and new ALCOA drop center aluminum disc wheels.

Five Million Worth Of Airborne Construction Units

One of the biggest peacetime military orders for motor graders has just been received by Caterpillar Tractor Co. Bought by Chicago Procurement Office, Army Corps of Engineers, the $5 million contract covers 328 No. 12 motor graders, 95 No. 933 Traxcavators and 25 D6 tractors.

The equipment has been modified to meet the 16,000-lb airborne limit. The machines will be used for military construction and dropped by parachute when necessary.



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GMC 71
REPLACEMENT PARTS
HIGHEST QUALITY — LOWEST PRICES

Plunger & Bushings	Spacers
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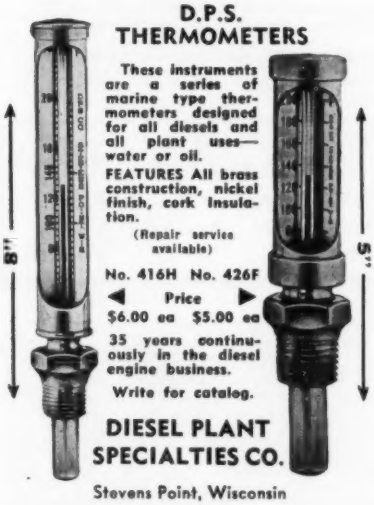
D.P.S. THERMOMETERS



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FEATURES All brass construction, nickel finish, cork insulation.
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news of our industry

(*Continued from Page 68*)

Durable Diesel

Here's a truck operating record to brag about. W. K. Davis logged over 320,000 miles in his 1954 GMC 660 sleeper-cab tractor without having to take the head off the 4-cycle engine. This record performance was piled up on runs for Frigidways, Inc., Memphis.

In that time the injectors were overhauled only once and at 316,000 miles the original fuel pump was replaced.

Our hats are off to Frigidways, Owner-Operator Davis and to that durable GMC diesel.

Hold That Price Line

The big fellows usually cop the headlines. Here's one small manufacturer making big news holding prices down against the spiralling trend everywhere.

Instead of going along with the general increase in the price of electric motors, Lima Electric Motor Co., Inc. elected to absorb higher costs and keep a stable price line unchanged since 1956.

This is a significant move by a small firm. It's Lima's answer to the fight against inflation. Incidentally, they found it paid off. Others please note and hold that price line.

Trained Truckers Top Others In Safe Driving

Truck Driver Training School at North Carolina State passed its 100th class milestone. In the past eight years 2000 have earned certificates and are now piloting trucks. These college-trained drivers are safer drivers. Their safety record is twice as good as those without this training.

No doubt these graduates also are taught and practice more effective and proper use of power, so important in keeping low both fuel consumption and maintenance costs.

While on the subject of drivers—trucking employees now get 32% more income than the average for the rest of private industry. Their national average for 1956 is $5,346—up $216 from the year before, the ATA reports.

Just one idea from this new Oakite Report may save you plenty!

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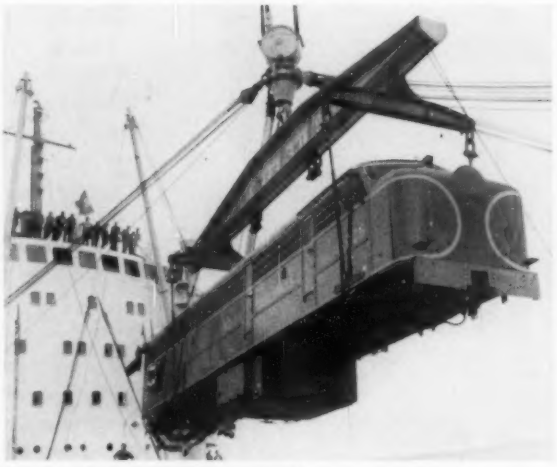

Diesel Cargo Heads for India

Twenty of these ALCO 1800-hp diesel-electric locomotives were swung aboard the "Belkarin" bound for Calcutta. They are part of 100 DL-500's ordered by the Government of India. Besides being the largest shipment of diesel locomotives to leave the Port of New York, they represent the biggest locomotive purchase by that country. Another first—these export units will be the first broad-gauge main-line diesels used in India.

The Government of Pakistan has also ordered 18 of these 1800-hp locomotives. They will supplement 51 ALCO's already in service there.

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Quality Fuel—with Economy

(*Continued from Page* 37)

similar burner fuels and diesel fuels are in basic characteristics.

For users of our construction equipment, the International Harvester organization will continue, as it has in the past, to work for the development and issuance of realistic diesel fuel specifications in order that the ultimate consumer may be assured of obtaining diesel fuels having quality with economy. We trust this simple presentation will lead the way for other equipment manufacturers and engine builders, as well as the petroleum industry, to aid in obtaining down-to-earth, practical, and usable diesel fuel specifications.

Credit should be given to the Petroleum Experiment Station, Bureau of Mines, U. S. Department of the Interior, Bartlesville, Oklahoma; the Automotive Research Committee of the American Petroleum Institute; and the Oil-Heat Institute of America for their excellent contributions and cooperation in the preparation of the National Diesel Fuel and Burner Fuel Surveys. Also, to the many members of the several SAE, ASTM, and CRC Diesel and Burner Fuel Committees for the considerable time and effort they have expended and are expending in the study and preparation of data concerning desirable revisions to the ASTM D-975 Diesel Fuel Classification and the D-396 Burner Fuel specification.

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DUTY . . . . . Continuous
CYCLES . . Not to exceed 6 per minute
PULL . . Approximately 10 lbs. over ½" stroke
WEIGHT . . . . . 2¼ lbs.

Model 5S

Model 5D

MODEL 5D
VOLTAGES . . . . (D.C. Only)
12V. 24V. 32V. 115V.
CURRENT DRAW . . (Pulling)
31A. 26A. 16A. 3.6A.
CURRENT DRAW . (Holding)
.60A. .31A. .19A. .07A.
DUTY . . . . . Continuous
CYCLES . . Not to exceed 6 per minute
PULL . . Approximately 10 lbs. over 1½" stroke
WEIGHT . . . . . 4 pounds

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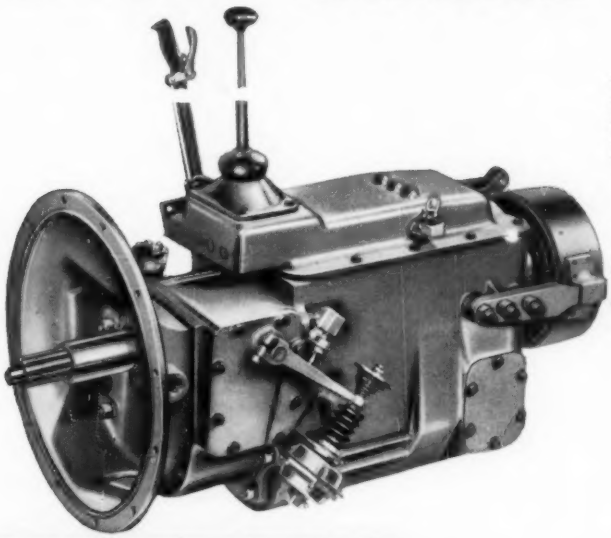

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Neodesha packs 1-2 performance punch

1 | *Nordberg Diesels* 2 | *STANODIESEL Oil M*

Operator J. N. Finkinbinder (left) and Everett Powell, Neodesha Superintendent of Electric and Water Plants, adjust rocker arm assembly of Nordberg Duafuel Engine. Engine operated 40,431 hours before overhaul, carrying about 90% of load. All engines in service at Neodesha are Nordberg's. All use Standard Oil's STANODIESEL Oil M.

Finkinbinder and Powell inspect oil filter used for filtering STANODIESEL Oil M used in all six Nordberg Diesels at Neodesha, Kansas, power station.

Quick facts about STANODIESEL OIL M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by using economy fuels.
- Maintains film on difficult to lubricate parts.
- Eliminates spark plug fouling in spark-ignited gas engines and reduces combustion chamber ash and deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil mix.

The city of Neodesha, Kansas, has six Nordberg engines in service. They have operated more than 400,000 hours on Standard Oil diesel lubricating oils. Here is the case story of one of these engines. The performance of this engine is typical.

In 1952, the city of Neodesha installed a 1,750 hp., 1230 kw., Nordberg Duafuel engine. During the period between February 14, 1952, when the engine went into service, and March 1, 1956, the engine ran 34,370 hours out of a possible 35,784. This is 96% of the engine's total installed hours. In this time, not even a piston or cylinder head was removed. So good was the performance of this engine using STANDARD HD Oil that when Standard introduced an improved diesel oil—STANODIESEL Oil M—in February, 1955, this engine was converted to this new oil.

There is more to the story. The engine continued in service to 36,223 hours when No. 7 cylinder liner was pulled to put rubber gaskets on liner to stop water leakage. At this time, No. 7 piston and liner were checked. Liner wear averaged only 0.0045 inches. The top ring showed an average wear of 0.016 inches. The No. 2 ring was 0.020 inches. Little, if any, wear was indicated on other rings. Now, at 40,431 hours, the engine is down for overhaul of turbocharger and to have valves ground. Bearings were found in excellent condition. No pistons are to be pulled.

Get more facts about STANODIESEL Oil M by calling the Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

STANDARD

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(Indiana)